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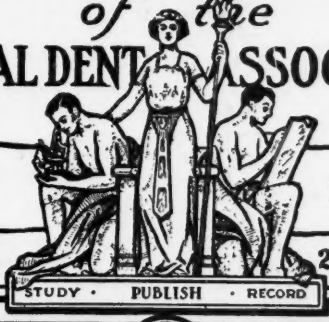

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JULY, 1919

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Significance of Tooth Form in Prevention of Oral Focal Infection.—*Friesell.*

"Fourteen Points" in Professional Success. —*King.*

Anesthetics in Dentistry.—*Henahan.*

Early Suturing of Wounds of the Face. —*Kazanjian.*

The Research Department. Reports by *Hartzell, Larson, Diehl.*

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1919 Meeting, New Orleans, Oct. 20-24

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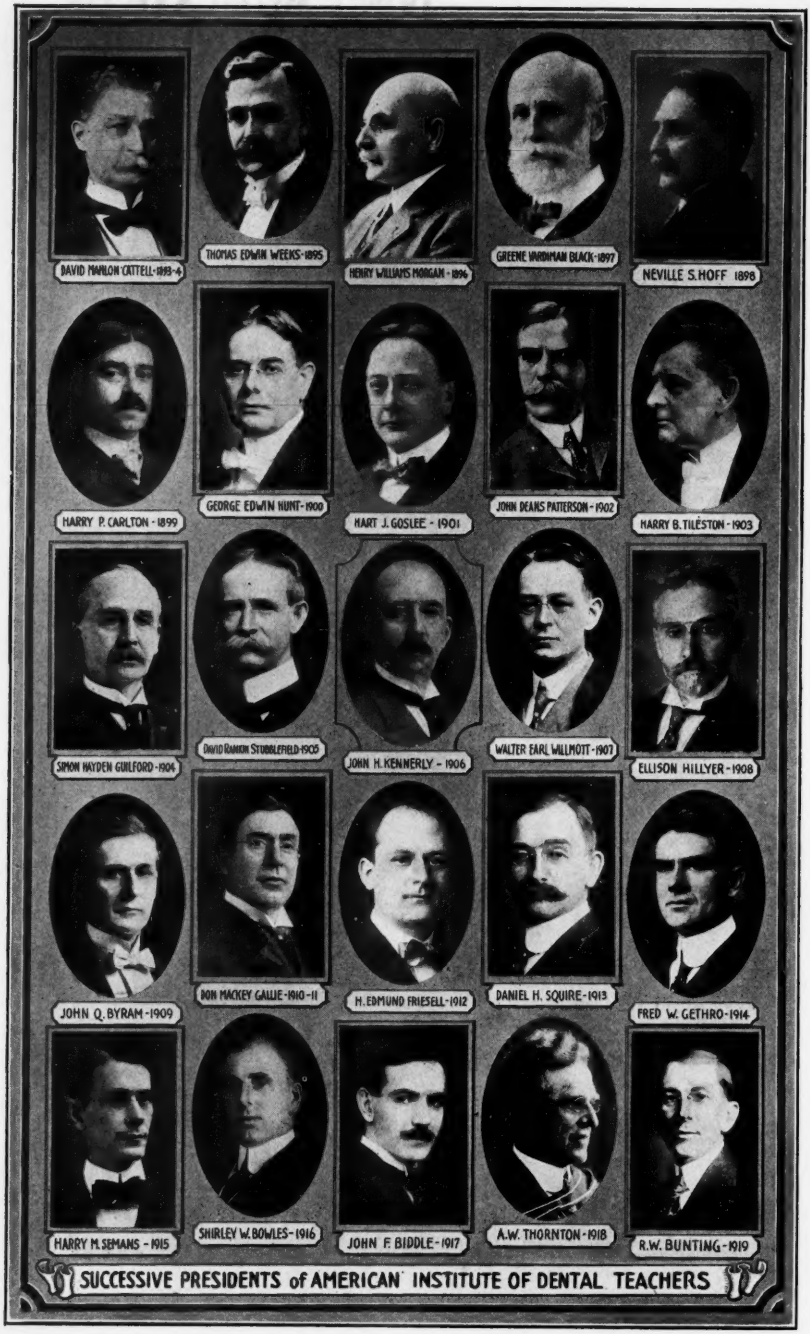
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SUCCESSIVE PRESIDENTS of AMERICAN INSTITUTE OF DENTAL TEACHERS

THE JOURNAL
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VOL. 6 JULY, 1919 NO. 7

Original Communications.

THE SIGNIFICANCE OF TOOTH FORM IN THE PREVENTION OF ORAL FOCAL INFECTION.

By H. E. Friesell, B.S., D.D.S., Pittsburgh, Pa.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

IT IS a fact, pretty generally recognized by dentists, that the health, comfort and usefulness of the teeth depend very largely upon the healthy condition of their investing tissues:—the gums, peridental membranes, and alveolar process. But the converse of this, namely, that the health of the investing tissues depends very largely upon the protection afforded to them by the form of the teeth, seems much less widely appreciated. Nevertheless the interdependence of hard and soft dental tissues upon each other, furnishes one of the most beautiful examples of nature's handiwork to be found in the human body.

Tooth Form In General.

In order that we may have a clear understanding of what is to follow a brief review of tooth form in general seems appropriate. Lying upon the body of the mandible and maxillary bones we have a lighter framework, or scaffolding, of bone called the alveolar process which surrounds and supports the greater portion of the roots of the teeth; the tooth roots being located in cavities in the process called alveoli. The alveoli do not surround the whole of the cementum-covered portions of the teeth—but only to a point about 2 to 4 millimeters from the cemento-enamel junction.

In naming the subdivisions of a tooth it seems appropriate to the essayist that they should be termed the crown, neck and root, (or roots as the case may be.) He would define the crown, as the enamel covered portion of the tooth; the

root, as that portion of the tooth normally enclosed in the socket or alveolus; and the neck, as that portion of the tooth lying between the crown and the root, or—that portion of the cementum covered part of the tooth not enclosed by the socket.

In general form the crowns of the anterior teeth, the incisors and cuspids, are shaped like a wedge with rounded angles; the labial surfaces are convex occluso-gingivally as well as mesio-distally. The lingual surfaces are concave mesio-distally, and also concave occluso-gingivally to the crest of the linguo-gingival ridge, which prominence renders the gingival portion of he lingual surfaces of these teeth convex. In other words the lingual surfaces are concavo-convex. The proximal surfaces are convex in both directions in the incisal half; and flat or slightly concave in the gingival portion.

The posterior teeth—the bicuspids and molars are cuboidal in form with rounded edges. The buccal and lingual surfaces are in general convex mesio-distally and occluso-gingivally, altho the extension of grooves from the occlusal surface may render them concave around the grooved portions of the occlusal third of the surfaces.

The proximal surfaces of the bicuspids and molars are convex bucco-lingually and concavo-convex occluso-gingivally. Sometimes in the gingival third they are also concave bucco-lingually.

The Height of Contour.

The gingival extremity of the enamel, or the junction of the enamel and cementum, is called the gingival line. If we pass from any point on the periphery of the occlusal surface to the gingival line in a direction parallel to the long axis of the tooth we will establish a line which will be either convex in its entirety, or convex in the occlusal portion and concave as we approach the gingival line. The points of greatest convexity on lines of this type drawn at various portions of the surface will not be on the same horizontal plane, or equidistant from the plane of the occlusal surface, but will vary in accordance with the general form of a particular tooth. If many of these lines be made on the axial surfaces of the tooth, running from occlusal surface to gingival line, the point of greatest convexity on each line marked, and these points connected with each other by a line circumscribing the tooth horizontally, that connecting line would indicate the *height of contour.* Or, if a tooth were placed upright upon a plane surface and numerous square edges were placed against it, the edge of each instrument would be a vertical line and would touch an axial surface of the tooth at a tangent. A line drawn thru the points of contact of square edges with tooth surface would be the *line of vertical tangents,* or as the essayist prefers to term it, the *height of contour.* If a tooth were viewed from the occlusal its lateral outline would be established by the height of contour; and the crest of the height of contour on the proximal surfaces would be indicated by the points of proximal contact.

Importance of the Height of Contour.

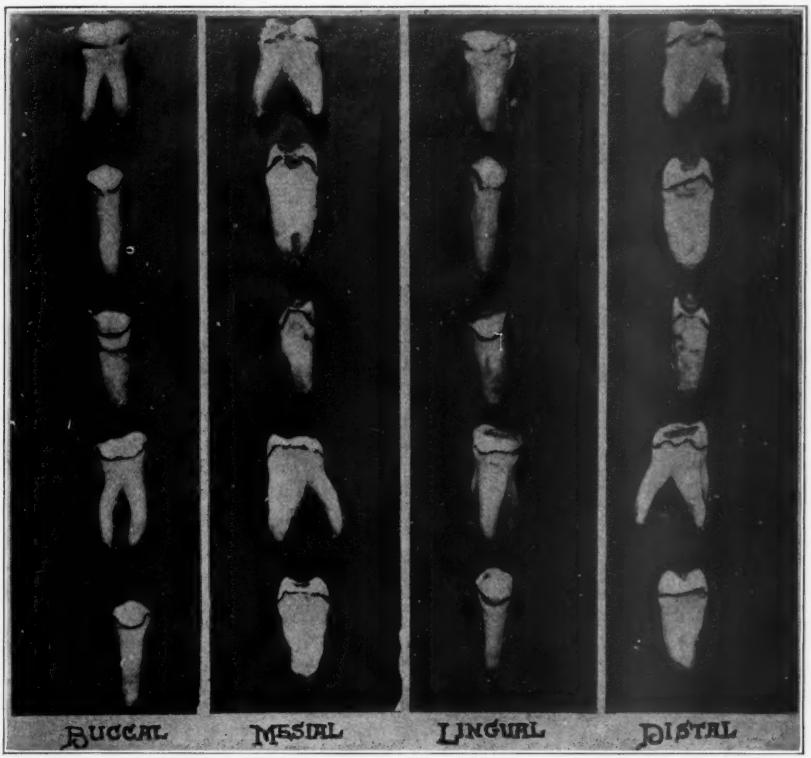
The height of contour marks the division between the clean and the unclean surfaces of the tooth. All tooth surface, (occlusal and axial), which lies to the occlusal of the height of contour is scoured by the food in mastication and is, therefore, a clean surface, upon which no extension for prevention is required. All tooth surface between the height of contour and the gum line is an unscoured, or unclean surface. Cavities of decay beginning upon such unclean areas will spread widely over the surface and extension of the cavity outlines will be required, in order to prevent recurrence of decay around the margins of the filling.

The general form of the height of contour as it passes around the tooth, and

is viewed from occlusal, is concave on buccal and lingual surfaces, and convex on the mesial and distal. It approaches fairly close to the occlusal extremity of the gingiva on the buccal and lingual surfaces; and on the proximal surfaces it inclines towards the occlusal, coming nearest to the latter surfaces at the contact points. (See illustration No. 1.) The gum line very largely parallels the height of contour around the tooth, the two lines approaching each other very closely on the proximal surfaces, and separating more upon the buccal and lingual. Any pronounced variation from the normal in the form of a tooth surface will cause a considerable variation in the height of contour.

To show how the height of contour may vary upon a tooth surface in accord with a departure from the ordinary form of that surface, a small marking device has been made. (See illustration No. 2.) The tooth is mounted horizontally between two holders which will establish its long axis in relation to the direction of force as applied in mastication; superimposed, and parallel thereto, is mounted another roller covered with a marking material. When the tooth is

Illustration No. 1.



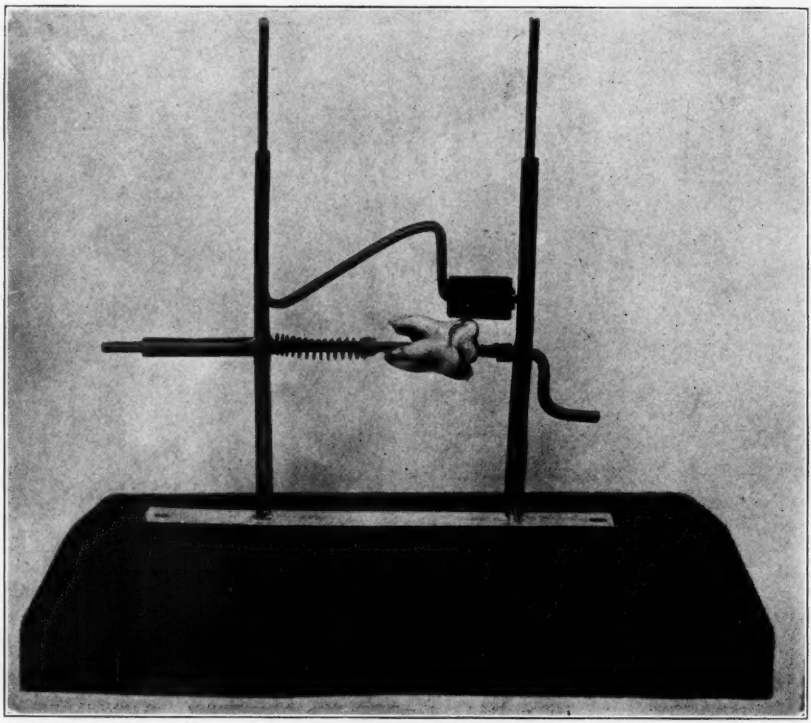
Variations of Height of Contour indicated by black line on the several surfaces of five teeth.

rotated against the marking roller, the highest points of each surface come consecutively in contact with it and indicate the height of contour by a line that is made by the colored roller. The name

THE CONTACT POINT.

The teeth of each jaw are arranged in the form of a semi-ellipse, the long axis being represented by the median line. On account of the form of the

Illustration No. 2.



Contouragraph, with tooth mounted for tracing of Height of Contour.

contouragraph has been given to this instrument.

Much stress has been laid upon the importance of the contact point, and it would be difficult to overestimate its importance; but the contact point is only a part of the height of contour, which latter has received entirely too scant attention in both dental literature and practice.

proximal surfaces, previously described, the teeth present convex surfaces at their widest mesio-distal diameters where they come in proximal contact, and as the proximal surface slopes away in all directions, (to the occlusal, gingival, buccal and lingual), from this place of contact, we have a form of proximal contact, as Black has described it, "such as would be made by the contact of two marbles,

or at a single small point." The form of the proximal contact then, is a point such as one would find between two convex surfaces in touch with each other.

The surface of the tooth immediately around the contact point will be convex but seldom uniformly so in all directions. It may appear spherical in one aspect and elliptical or ovoid in others; but in any case the actual contact should be a point of contact, not a line, or a surface of contact.

It should be remembered that the essayist is referring to the ideal, the desirable, the best form of contact: the type that we find most frequent among the best preserved dentures.

Position of the Contact Point.

The position of the contact point is equally as important as its form. It will not do to build up a convexity at any part of a proximal surface and because it necessarily comes first in touch with the approximating tooth, conclude that we have made a satisfactory contact point. The position of the contact point depends to a very great extent upon the form of the tooth: the form of each surface, its height of contour, the mesial and distal marginal ridges and the position of the tooth in the arch. To know where to place a contact point demands an intimate knowledge of tooth form. The best way to obtain that knowledge is by a careful study of Black's Dental Anatomy—the most important work in dental literature—in conjunction with the study of extracted teeth, prepared skulls, and finally the teeth of each patient.

In the best form of denture, composed of bell-crowned teeth the contact points will be found to be in a line with the cutting edges of the incisors and cuspids, and slightly to the lingual of the buccal cusps of the bicuspids and molars. However, in thick-necked teeth, and those of a more rounded contour, the contacts may be placed slightly more to the lingual. In some dentures where the second and third molars are small and more rounded than usual, the contacts may be located midway buccolingually.

In the best formed arches the contact points are near the occlusal surfaces, and only so far away from them as will result from the normal sloping of the marginal ridges. If the contact points be placed too close to the occlusal surface there will be a decrease in the amount of food that sweeps thru the embrasures and a consequent lessening of the scouring or polishing of the exposed proximal enamel, with the result that caries will have a greater opportunity to attack those surfaces. If the contact be made too far toward the gingival, as will be the case if the marginal ridge is not reproduced, the tendency will be for food to wedge the teeth apart, allowing it to impact upon the septal gingiva, something which must *never* be permitted. The septal gingiva fills the septal space in the form of an arch, with its convexity towards the occlusal, and the contact point should be placed where it will be just over the crest of the arch of the septal gingiva.

Marginal Ridges.

The mesial and distal marginal ridges are strong ridges of enamel, which form the mesial and distal boundaries of the occlusal surfaces of bicuspids and molars, and the angle of junction of the occlusal surface with the mesial and distal surfaces. These ridges are crossed by a faint groove, or fine line, indicating the line of junction with the lingual lobe of the tooth. They are rounded slightly towards the proximal surfaces, merging into the proximal convexity that extends to the height of contour.

The Interproximal Space.

The teeth are considerably broader mesio-distally between their contact points than they are at the gingival line. This results in considerable spaces between them called interproximal spaces. The interproximal space extends from

the crest of the alveolar process to the occlusal angles of the teeth, and is bounded bucco-lingually by the buccal and lingual planes of the teeth. It is subdivided into the buccal and lingual embrasures and the septal space. The septal space is normally filled by the septal gingiva. The width and form of the interproximal space are very important, because if the space is lessened by a dropping together of the teeth, as a result of proximal decay, or by an improper contouring of the proximal restoration, the health of the gingiva will be imperiled, thus inviting further proximal decay and peridental injury.

The restoration of the proper form of the interproximal space is just as important as the restoration of the proper form of any tooth surface. A surface contact, or a line contact bucco-lingually, will necessarily render the buccal and lingual embrasures more narrow and limit the amount of food passing thru them with the results previously mentioned. Between the anterior teeth, on account of their arrangement in an arch, the labial embrasures are larger than the lingual, while between the posterior teeth the lingual embrasures are wider than the buccal due to the lesser size of the lingual lobes of the teeth.

Relation of the Soft Tissues to the Teeth.

The Peridental Membrane covers the root and neck of the tooth from the apex to the gingival line. It serves as a cushion to the tooth, suspends it in the socket against displacement, possesses the tactile sense of the tooth, and in its gingival portion affords attachment of supporting fibres which extend from the neck of one tooth to that of its approximating neighbor. It also gives rise to fibres that extend into and support the free gingiva.

The *Gum Tissue* covers the alveolar process, the neck of the tooth and envelopes the gingival margin of the crown of the teeth for about two to three m/m on the buccal and lingual surfaces, and almost to the height of contour on the proximal.

That portion of the gum tissue which lies to the occlusal of the crest of the alveolar process is called the gingiva. It is subdivided into the body of the gingiva, the free gingiva and the septal gingiva. The body consists of that portion of the gingiva which lies between the crest of the alveolar process and the gingival line.

The free gingiva and the septal gingiva are attached to the body of the gingiva and form the free flap of gum tissue which covers certain portions of the enamel. That part of the free gingiva which occupies the interproximal space is called the septal gingiva.

The filling of the septal space with gingiva and the health of that septal gingiva depend primarily upon the proper size and form of the interproximal space. It will be noted that the interproximal spaces between the anterior teeth are necessarily much narrower, than are those between the posterior teeth; but nature has provided for this condition by extending the proximal curvature of the gingival line much further toward the occlusal on the anterior teeth.

The free gingiva hugs the teeth tightly but is not attached thereto. As it approaches its occlusal extremity it becomes thinned to a very fine edge, which serves, so long as the tissue remains healthy, to prevent the ingress of food, debris, etc. into the sub-gingival space. The septal gingiva is in the form of an arch, or wedge, with its crest or apex towards the occlusal and just beneath the contact point. It slopes off in two inclines towards the gingival, the shorter and steeper slope being toward the buccal, and the longer and more gentle slope being thru the lingual embrasure. Between the anterior teeth the slopes are nearly equal.

FUNCTIONS OF THE CONTACT POINT: ETC.

The tooth is held in place by the peridental membrane; when this membrane becomes diseased the tooth suffers proportionately in loss of function; when the peridental membrane is lost the tooth goes with it. When the peridental membrane becomes exposed to the secretions and the flora of the mouth it becomes readily diseased. It does not stand exposure to mouth conditions.

The gingiva therefore serves as a covering and protection not only to the crest of the alveolar process, but to the peridental membrane as well. A healthy peridental membrane is absolutely essential to the retention of the tooth, and as the protection of the peridental membrane depends so largely upon a healthy gingiva, the care of the latter tissue and the maintenance of its health become paramount in dental practice.

Injury to the gingiva by the impaction of food, the encroachment of calcular deposits, the irritation of dental appliances, or by the careless or ignorant use of instruments must be carefully guarded against.

The impaction of food, following the ravages of caries or unskillful dentistry is the most prolific cause of injury to the gingiva and peridental membrane. Tooth form, as it exists originally, or as it is properly restored will fully protect these tissues against such injury.

The height of contour on the axial surfaces of the teeth causes the food to be shunted off and strike the gingiva at a tangent instead of directly as happens when the height of contour is lost.

The contact points hold the teeth in their proper relationship to each other occlusally; maintain the proper mesiodistal width of the interproximal space; and protect the crest of the arch of the septal gingiva. They prevent the food from passing directly thru and crushing the crest of the arch, and divert it buccally and lingually into the embrasures, where it strikes the inclines or slopes of the septal gingiva at a tangent and passes harmlessly into the buccal or lingual cavity, to be returned to the occlusal surface by the tongue or cheeks until mastication is complete.

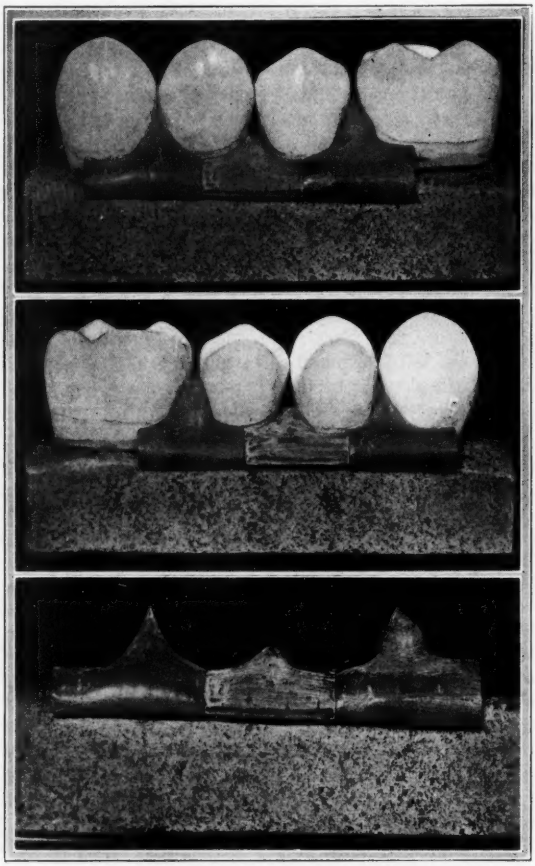
The mesial and distal marginal ridges serve as rims to keep as much of the food as possible on the occlusal surface where it can be crushed by the occluding teeth. Their proximal slopes help to give proper approach and contour to the contact point and height of contour; and the form of the marginal ridges, contact points, and height of contour combined, serves to direct the food that passes into the proximal spaces in such a way that it will do no injury to the investing tissues.

If the contact be too broad bucco-lingually it will form a line contact instead of a point; will diminish the embrasures and prevent the scouring of much of the proximal enamel. If the contact be too broad gingivally as well as laterally, it will become a surface contact, food fibres will be caught and held between the teeth, wedging them apart, and as other fibres accumulate, the whole mass will crush against the septal crest flattening it and leaving a space between the teeth to become filled with food fibres and give rise to injury of the tooth or gingiva thru fermentative or putrefactive changes. (See illustration No. 3.)

Sometimes in cases of proximal impaction of the food from faulty contacts we find the septal tissue not only flattened bucco-lingually, which permits food to strike it directly instead of at a tangent, but even depressed in the center forming a pocket. Inflammation results and the gingiva in the buccal and lingual embrasures become swollen and hypertrophied; suppuration occasionally follows and a gingival abscess develops which not infrequently discharges on the buccal or lingual surface of the gum, and simulates the opening of a sinus from an alveolar abscess. (See illustration No. 4).

There are two principal foci of infection in the mouth; two main portals by which oral infection passes into the system. One is thru an open root-canal in normal health and form there will be no exposure of the gingival portion of the peridental membrane, and thus the most frequent oral focus of infection will

Illustration No. 3.



Top.—Buccal view of gingiva; left, normal; center, flattened; right, hypertrophied.
Middle.—Lingual view of gingiva; left, hypertrophied; center, flattened; right, normal.
Bottom.—Model of Gingiva from buccal view.

by which toxic matters pass beyond the apex and are absorbed; and the other, and most common one is by the side of the root, thru the exposed peridental membrane. If the gingiva is maintained be avoided. Full recognition of the importance of the gingiva; careful observation to detect its slightest departure from the normal; the early removal of the cause of the trouble; and the

restoration of proper tooth form will maintain the gingiva in sound health.

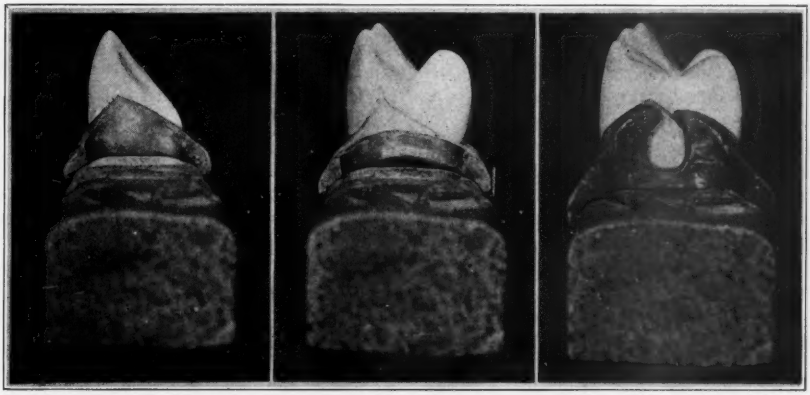
The principal cause of the exposure of root-canals is dental caries. The scouring action of the food prevents decay on clean surfaces, and the healthy gingiva stops the spread of decay on the axial surfaces. As long as the height of contour and the proximal contacts remain in proper form, the occlusal and approximal surfaces, as well as much of the buccal, labial and lingual surfaces will be protected from decay and thus the liability to the exposure of the pulp thru extensive cavities will be greatly lessened and thereby the second most common focus of infection in the mouth will, to a great extent, be eliminated.

If the proper form of a tooth be maintained in its marginal ridges, height of contour and contact points, the most prolific cause of peridental disease will be eliminated. The dentist who makes himself familiar with tooth form and developes the skill to restore it, or maintain it, may be safely trusted to work no injury to the investing tissues of the teeth thru the placing of crude appliances, or by careless instrumentation. I doubt whether any other kind of a dentist should be permitted to operate in the human mouth.

The conception of tooth form possessed by too large a percentage of the members of our profession, if we are to judge by their restorations:—(which is placing a charitable construction upon the matter), is just about as near correct as the ancient Japanese idea of the human viscera.

And now, while we are having post-graduate courses in many branches of dentistry, it seems to the essayist that one of the most important fields for such work would be some real post-graduate study in Dental Anatomy.

Illustration No. 4.



Section of gingiva from proximal aspect. Left, normal; middle, flattened; right, hypertrophied, and depressed in center.

Discussion.

J. V. Conzett, Dubuque, Iowa.

We always expect something good when Dr. Friesell speaks and the present occasion is no exception to the rule. The paper just presented is not only good but exceedingly timely, for there is nothing in operative dentistry of more importance than the reproduction of the form of the tooth, and you cannot restore that which you do not know, therefore

the importance of the paper in emphasizing the necessity of a thoro study of dental anatomy. As is general anatomy to the general surgeon so is dental anatomy to the dental surgeon. If you do not know the form, size and shape of the normal tooth you cannot reproduce that tooth when you are called upon to remedy the ravages of decay. It is said that a good comparative anatomist can reproduce the entire animal from a study of one of its bones. How many of us can even name the different teeth if they were presented to us separately and out of their natural environment, and yet it should not be so; we should be so familiar with the shape and anatomy of all of the teeth that we could instantly tell what tooth was presented to us under any circumstances. The principle study of the dentist should be teeth. Dr. Prime usually goes about with a pocket full of teeth and is constantly studying them and by this means has become so familiar with them that he is an authority on tooth form. In some way—either that or some equally good way—we should all emphasize the study of tooth form in our daily practice.

I cannot touch upon all of the many good points that Dr. Friesell has elaborated, to do so would impose upon your time to too great an extent, but I do want to emphasize one or two of the more important ones. The reproduction of the mesio-distal diameter of the tooth when that portion of the tooth has been lost to some extent by the ravages of decay, is a most important procedure and one too frequently neglected. If the contour of the tooth has been lost to any appreciable degree it will be necessary to obtain separation in order to restore it. This may be done by previous separation or by means of the immediate separator at the convenience of the operator or as the nature of the case may suggest. If the loss of tooth structure has been very great in this direction, it may take a good deal of time to properly restore it, and the packing in of guttapercha from time to time and letting the patient chew upon it will restore sufficient space to properly contour and shape the tooth to its normal condition.

The restoration of the interproximal space, thereby allowing the septal tissue to assume its normal function of protecting the proximal surface of the tooth from food debris and organic accumulations, is another very important point. This is done by restoring the proximal contour and the proper shaping of the contact points. It will be well for every dentist to study that portion of the paper until he becomes perfectly familiar with the proper placing of the most important point. Anything that I might say cannot do more than emphasize what he has said and less I might detract from the force of his splendid presentation of that part of his subject, I only want to advise you to study it again and yet again.

As a last point—for I must not detain you farther—let me emphasize the necessity of reproducing the anatomy of the occlusal surface of the tooth. Nature always has a plan and a reason for the plan, and when she shaped the occlusal surface of the tooth in a special way, she did it for a special reason. We can do no better than to follow her as closely as we can. Some of our wise men point out the mistakes of nature, but when she repeatedly does the same thing and continues to do so thruout generation after generation we may conclude that she knows pretty well what she is about, and if we do not yet know the reason we are safe in following her in the assurance that as we advance in wisdom and knowledge that we will find out that she is right and we will know the reason if we do not now. The reproduction of the marginal ridge is of the utmost importance as it prevents the food under the stress of mastication from being forced in between the contacts, as it will be if the occlusal surface of the filling is

allowed to slope toward the contact. The reproduction of the marginal ridge and the sulcus of the tooth provides a form that causes the bolus to be forced away from the proximal surface toward the middle, grinding surface of the tooth where it can be more finely divided and does not endanger the septal tissue by being forced into the proximal space.

I want to thank Dr. Friesell for the inspiration of his paper and to commend him for the time and study he has placed upon the subject that we might be benefited thereby.

H. B. Tileston, Louisville, Kentucky.

When Dr. Friesell does anything, whether it be writing a paper or making a report or what not, he usually does it so thoroly that there is little room for criticism, and small opportunity to add anything worth while, to what he has done.

It is so in the case of this paper he has presented on "The Significance of Tooth Form in the Prevention of Oral Infection." In discussing it I can only indorse all he says, while offering a few thoughts more in the way of emphasis than of criticism.

Truly the evolution of the human teeth to adapt them to the needs of omniverous man has produced organs more intricate in anatomical detail and more marvelous in the performance of their special function than appears to the casual observer.

Dr. G. V. Black was a wonderfully keen observer, and the accuracy of his observations and descriptions in his work on Dental Anatomy have never been excelled and seldom equaled by other scientific writers.

It has remained only for others to make application of the knowledge he revealed to us in the task of preserving the teeth and their investing tissues in a state of health, or of restoring them if impaired.

Dr. Friesell's paper is a distinct and valuable contribution to the practical application of our knowledge of tooth form in the prevention of foci of infection about the teeth, with the consequent liability to systemic disease.

He has given us a new term in "height of contour," which will take a permanent place in dental literature. By this term and by means of his ingenious methods of demonstration, we get an instant comprehension of the line that marks the greatest prominence on the axial surfaces of molars and bicuspids, as well as its significance.

Every prominence, every depression, and every minute marking upon a tooth surface have their uses and a definite relationship to the efficient functioning of that particular tooth. The fossa upon the occlusal surfaces of molars are just so many little mortars in which the cusps of the opposing teeth act as pestles. The mesial and distal marginal ridges complete the bowl of the mortars, but these ridges do not present a perfectly smooth surface. Close study reveals little grooves or gutters leading across the ridge, one to the buccal, the other to the lingual. These markings are sometimes so faint as to escape notice except when light rays are reflected at a favorable angle. Nor does the cusp of the opposing tooth fit perfectly into the fossa like a pestle fits into a mortar. There is a triangular space at the bottom of the fossa into which the cusp does not reach. Now what is the purpose of these apparently insignificant things?

When food is crushed between the opposing teeth and becoming more or less fluid by admixture with saliva, the mass flows out of the mortar-like fossa into which the cusps of the occluding teeth fit with sufficient inaccuracy to permit of its ready escape, and, guided by the grooves and lines above referred to, passes over the marginal ridges to the buccal and lingual surfaces. Here the food glides over the convexity at the

"height of contour" and over, not under, the free gingival margin.

Thus it is seen that the pronounced convexity of the buccal and lingual surfaces not only marks the line between habitually clean and unclean areas, but overhanging the gingival margin, protects that delicate structure from injury and subsequent disease.

When making restorations of natural bicuspid and molar crowns, either in whole or in part, the dentist should observe not only the proper formation and correct placement of the interproximal contact point, which has been sufficiently emphasized by Dr. Friesell, but should as earnestly, I might say religiously, strive to reproduce the occlusal cusps and planes and developmental markings and the natural convexities of the buccal and lingual surfaces, more pronounced upon the buccal than the lingual, if he would prevent the initiation of foci of infection under the gingival margins surrounding those teeth.

To those who possess an intimate knowledge of natural tooth forms, especially to those who have taught dental anatomy in the colleges, it seems inconceivable that any dentist should be ignorant of the outlines of a tooth; yet the crude restorations seen in the mouths of people who come under observation from time to time in practice, are convincing evidences of either gross ignorance or gross carelessness or both, on the part of the operator.

I agree with the essayist in saying that dentists who are not skillful enough to reproduce the natural tooth forms in their restorations should be looked upon as unworthy of the great work involved in preserving the teeth and their investing tissues from destruction by caries or infectious disease.

John F. Dwight, Des Moines, Iowa.

When I stop a moment and take an invoice of my sensory nerves, there is one place that my attention is attracted to, and that is to the proximal space between my first molar and second bicuspid. I have had three inlays placed in there, and we have taken great pains with the marginal ridge, but for some reason the dental anatomy has not been correctly reproduced. I have a condition in the sub-gingival space there that is gradually producing a very fine case of pyorrhea. This has been going on for three weeks, and I am still trying to overcome that.

I think these fine ideas that we get sometimes slide off without our taking them home, but as I have heard this paper this morning, I have taken it to myself and I suppose if this pain continues for awhile, I will as least make very fine contact points and look thru the embrasures at least until I forget my own troubles.

Edmund Noyes, Chicago, Ill.

It is impossible to overestimate the importance of what has been presented to us this morning. I remember the time when the talk was as active about contour fillings as it is now about focal infections, and Dr. Perry, of New York, and Dr. Black and Dr. Cushing and Dr. Atkinson and Dr. Varney and Dr. Webb had a great deal to say about the reproduction of tooth contours, and the re-establishment of a proper contact point. We shall never get past the necessity of talking about those things and doing those things. Every good operator spends uncounted hours longer in making his operations for the sake of restoring these contact points and tooth forms properly. It is more work, it requires closer attention, and it requires much more minute care in finishing after the operation is inserted. In other words, it all means a lifting up of ideals and a strenuous effort in practice to attain ideals.

The question of occlusal forms, I must confess, in my own cases did not receive so much attention for a long time. What Dr. Conzett has said is a very pointed

and very good illustration of its value. I do not believe, however, as some men have seemed to advocate, that it is necessary to reproduce in occlusal forms, every crease and sulcus and depression that could be found in the freshly erupted natural tooth. Those things are modified by wear in many cases. And when we have a man of forty years of age, it is not necessary that we should restore the occlusal form that he had when he was ten years old, but notice a little what the occlusal form is at present in his other corresponding teeth. The main necessity, as I understand it, is that the marginal ridges shall be restored,—and sometimes you will find that the occlusion of the opposing teeth will not permit that. I do not know; I am not prepared to say whether we should grind the opposing tooth until it will permit it or not. I will leave that for you to determine in each individual case as it comes to you. But the marginal ridges should be restored so far as the opposing occlusion will possibly permit.

And then it seems to me the important matter is that there should be a depression in the occlusal surface of the tooth, a depression from the mesial and distal toward the center, from the buccal and lingual toward the center, so that the opposing tooth may not quite reach the bottom of the depression. There should be a little space in there to catch and hold food for grinding and the grinding is done towards the buccal and lingual portions of the occlusal surface. We do the same thing with artificial teeth.

Some times I think this has to be compromised a little. Some times a tooth has been weakened so much by decay that we can not ask it, by any means of restoration that is practicable, to fulfill perfectly its former function. We may be obliged to compromise a little in the height of the buccal and lingual cusps for safety against grinding stress.

It is of the utmost importance that we consider the ideal form and have it clearly in our minds, but we must remember that sometimes we must sacrifice the ideal to a limited extent for the safety of our operations. (Applause.)

Joseph Johnson, St. Paul, Minn.

I did not hear the beginning of the paper, but I wish to sound a note of caution in application of the rubber-dam on the teeth, especially on the anterior teeth, where gingival decay has taken place. Good sound healthy gum tissue can be destroyed by the use of ligatures and the use of clamps, in order to get a free field for the operation.

Therefore, where decay has taken place near the gingiva, it would be better, I think, to place such a filling there, which would not involve laceration or injury to the tissue. We ought to use our judgment and choose that which would be the best for the life of the tooth.

Herbert C. Miller, Portland, Ore.: I consider that this paper is one of the most important that has been presented at this meeting. It is very timely; it indicates clearly to us the importance of further review and study of our dental anatomy.

We have two kinds of dishonesty. One we might class as conscious and the other as unconscious dishonesty. I do not believe many of us, at least those of us who are here, are inclined to practice conscious dishonesty. But to continue the practice of these operations without a proper understanding of the anatomy and the requirements in these cases is thoroly dishonest.

I therefore say that this paper is one of the most important that has come before this meeting, and it impresses upon my mind the importance of returning to this most important subject and giving it the consideration to which it is entitled.

Edmund Noyes: I do not like to see a disposition to dispense with the rubber-dam. If a tooth be filled, the indispensable consideration is to make your arrangements and carry them out so as to make a good operation. I believe that the danger to the peridental membrane from the use of a ligature for half an hour or an hour is greatly exaggerated. I have been using them for forty-five or fifty years, and the instances where I could possibly suppose that subsequent damage was done, have been very few.

I have used also the orangewood wedge, and the cases of permanent subsequent injury that I have observed, have been exceedingly rare. These tissues will bear the strain of compression and even slight wounding for a short time and will recover. In the cases where proximal cavities have extended beyond the gum margin, pretty nearly to the alveolar border you must uncover the extreme limit of decay in some way or another, so as to have access to it and vision of it and control of it, for dryness to make a good operation.

H. E. Friesell (Closing the discussion:) The main purpose of the paper is to again call attention to the importance of familiarity with fundamental principles in dentistry. If one knows the underlying principles, many of the things that are otherwise obscure will become comparatively simple. The question of preventing oral focal infection I believe is absolutely in the hands of the dentist, and if he can get his patients early enough to properly take care of their teeth, as they grow up from childhood, that he can prevent oral focal infection, and that, we know, is the best way to cure it.

We are inclined to think that we know what a tooth looks like, when the truth of the matter is that many of us only *think* we do. I am very earnest and sincere in my recommending to each one, no matter how much he has already studied the subject, to study it more thoroly, because from the results that we see in practice we are convinced that if the operator knows his dental anatomy, he certainly does not appreciate its importance. He does not take advantage of his knowledge. The next point is the importance of the gingiva. The first thing for the dentist to consider in an examination of the mouth is not how many holes there are in the teeth, but what is the condition of the investing tissues. We should locate the cause of any departure from the normal and remove that cause, and prevent its recurrence if possible.

The restoration of tooth form and the repair of cavities of decay in a tooth is only a detail in dental service, and it is comparatively an unimportant detail if the operator does not include the restoration and maintenance of the normal health of the investing soft tissues.

Another point that your essayist tried to bring out, is that it is not simply a contact point or a general tooth contour that is to be kept in mind, but that the general shape of the proximal surface, the shape, form and size of the interproximal space, the interdependence of these, together with the slopes and the position of the soft tissues must all be taken into consideration; they must be harmonized in the building up of our restorations.

We can make a cog wheel and make the cogs so that one cog passes in between two others. We may have a very defective machine. But the engineer studies out the relative angles of the various faces of each cog, and he makes a machine that does its work much more efficiently than if he simply put up two wheels with spurs that interdigitated with each other. The same thing applies especially to our proximal restorations, and perhaps in a less degree to our buccal, lingual and occlusal restorations.

"FOURTEEN POINTS" IN PROFESSIONAL SUCCESS.

By Otto U. King, D.D.S., Chicago, Illinois.

(Read before the Chicago Dental Society, May 20, 1919.)

IN THIS paper, we have capitalized the news value of President Wilson's world famous dicta, as a basis for the discussion of the principles underlying professional success or more particularly the laws involved in dental economics.

The Why of the Ordinary Dentist.

There is a great deal being said these days about the mediocre. The ordinary man. And yet there is only one thing that can make the ordinary dentist. It is to do ordinary things in an ordinary way. The big man or dentist is the one who does the ordinary thing in just a little extraordinary way.

The world is progressing today at greater speed than ever before. Developments and improvements are on every side.

Unless a dentist possesses a desire to overcome, to surpass, to stand first in line in his profession, he can never hope to reach the real successful goal. He can only hope to be the ordinary dentist. The love of gain cannot inspire one to the highest endeavor. There must be something greater, something more enduring to call forth one's supreme efforts and satisfy one's ambition.

We must have the spirit of our boys who went forth to fight for human rights and liberties. The late Elbert Hubbard said: "The rewards of life are for service, and the penalties of life are for selfishness."

Every man here would like to win. The love of victory is implanted in every man's heart, and the greatest game in all the world is the game of success.

Winning Success—How.

Winning success is a serious matter. It cannot be accomplished in an easy or off-hand manner. There is no short-cut or royal road to the goal. It is a hard pull up hill over a rocky, if straight road, all the way. You cannot make it without climbing, nor without bruises.

Mythology tells us that there was once a very skillful man who tied a very intricate knot, and said that a man who achieved a certain great feat must first undo it. Centuries went by, and nobody was able to disentangle it, until at last there came a man who saw a little more clearly than the common people. He tried for a long time to unravel the perplexity, but found it impossible. So then he drew his sword, and crying, "this knot shall be undone, and thus I undo it," he cut it in two.

The knot tied by King Gordius seems ever to have been the barrier to achievement. Thru all ages ambitious men have failed to reach the goal of success, because they were unable to disentangle the problems which formed the knot. Alexander of Macedon was able to solve the difficulty by cutting the knot with his sword; but we of today cannot use such undiplomatic methods—violence will avail us nothing. The Gordian knot of modern times may be easily un-

raveled by studying the principles or laws of success.

Failure and ignorance have ever been tied together by the knot of ignorance.

Things That Are Certain.

There are no accidental successes in the business or professional world. Chance may put a man into a responsible and high-salaried position, but chance will not keep him there.

The dentist who builds up a permanent practice must believe in certainties. It is certain that the dentist who understands and applies sound principles will make a greater success than the one who guesses or imitates.

It is certain that the dentist who is not continually training himself will never succeed in developing to the highest efficiency his own abilities or his practice.

It is certain that the dentists of tomorrow are the men who are today reaching out and acquiring broad, well-balanced business and professional knowledge.

The Absolute Law.

The ordinary dentist suffers either from ignorance or from laziness. He wants power—he wants the good things of life— he wants to stand for something in his profession. But he has failed to realize that what he will get from the world is in exact ratio to what he can give it. The law holds good "that he can get as much as he can give." The matter of giving, however, is dependent upon the amount of knowledge he can take in. He must work to get that knowledge.

The Basis of Success.

Success is based entirely upon quality of mind and its training. Mind power is built up on exactly the same lines as physical power, with this difference—there is no limit to its development.

The power which has made all the great captains of industry, all the great scientists, all the great dentists, is mind. And that power has been built by constant, never-ending reaching out for more information, better information and the gathering together of standard rules and principles, which, once known, abolish the necessity for grinding out details over and over again.

The Royal Road to Power.

The dentist who does his work half-heartedly, who won't give a few minutes a day for gaining more knowledge than he needs for his work, will never stand in the arena with the winner.

One of the wisest men of his generation, John M. Siddall, editor of the "American Magazine," recently said:

"When I am dead they should write over me the following brief sentiment:

"' This man lived a fairly active life, in the course of which he made just one discovery—that there is no substitute for work.' "

I have pondered that remark many times, and particularly in these recent weeks. For we are living in a day when the air is full of the glowing claims of substitutes and of panaceas.

Men talk as if victory were something fortunate. Work is victory. Wherever work is done, victory is obtained.

Every day a dentist should ask himself, "How much more information have I today than I had yesterday?" Understand, it's a question of mathematics.

The amount of money one takes from the world will depend upon the development of the mental muscles with which one takes it.

Equipment That Spells Success.

The men who are making dental history today are not just "half ready"; they are a little more than ready for any problem in dentistry that presents itself.

Napoleon Boneparte said, "Get your principles right; the rest is a matter of detail."

Know the Principles.

We all know that business is best studied, best understood, and best managed by men who, from attention and experience, have full knowledge of business facts, who, by careful thought, can trace each result to its cause, and who from principles thus obtained can see what the effect is to be of every order given. For men thus trained, giving full attention to their work, the element of chance is greatly eliminated. Business or professional success is not a matter of luck; it is the result of accurate knowledge and cool judgment. The really great business man seems to the beginner a wizard, a reckless taker of chances. Not at all. The master sees, and interprets, and knows, where the small man guesses.

Study the Great Masters.

It is worth while to study the lives of the great masters—to learn of the principles underlying their success in their special fields.

Don't fool yourself into believing that the "great masters are fakers." It was not by any sort of electioneering, jockeying, or managing that Bacon, Plato, and Emerson were elected to their special positions as thought rulers.

Gray Matter is What Makes the Man.

Gray matter is what makes the man—the amount of brains he has and the quality, and the way in which the gray matter works. Success, achievement, growth lie in the individual himself. There is no magic formula that makes men win. However, there are some very definite laws or principles that are the basis of real and lasting success.

Fourteen Points Discussed Under Two Headings.

For the purpose of a more careful and practical discussion of the fourteen points, we have divided them into two groups, in the first ten points we will outline and briefly discuss the ten laws or principles involved in an individual dentist's success. In the remaining points we will suggest four definite propositions toward which organized dentistry should aim its energies in order to secure a better professional standard and thus, by helping to build a stronger race, to increase our value to society.

Some men of affairs endeavor to prove that the commercial standards of the world have changed during the past half century. Whether that statement be true or false, the fact remains that the basic principles of morality have not changed. What was dishonest one hundred years ago is dishonest today, and true success is still quite as far from being a matter of dollars and cents. This brings us to our first point—Integrity.

First Point—Integrity.

If there is one asset that counts for more than anything else in the struggle for professional success, it is unimpaired self-respect. The ability to look every man straight in the eye—to feel that nowhere in the world is there anyone who can justly charge you with dishonesty—are tests of character that represent a capital from which the professional man may draw sufficient strength to enable him to rise superior to all adverse conditions.

"Shady" Action Found Out.

The ethical aspect of the question, disregarded one great disadvantage of a dishonest action is that it is likely to be found out. Thus, when a professional or business man permits himself to do anything that is "shady," somebody is pretty certain to discover the deception, and then it is merely a matter of time when the fatal truth—exaggerated out of all proportions perhaps—will have gone its rounds. It makes no particular difference what sort of deception it is of which a professional man has been guilty—his reputation is gone as soon

as the fact becomes generally known, and with it vanishes that confidence of the patients which is the very foundation of a dentist's success.

It is surprising how few persons realize the extent to which success depends upon their own actions and thoughts.

Firm Foundation of Character.

Modern psychology teaches us that before any of the laws of mental control can be put into successful operation, there must be a firm foundation of character upon which the structure of success may be built, and the very corner-stone of this foundation must be the qualities that we denote as "honesty."

Success is so much a matter of mutual confidence that it extends far beyond the plan of patient and dentist. It is the basis of all successful business operations. It is the foundation of all matters of finance.

In the business world, the giving of short weight is undoubtedly one of the most reprehensible and contemptible kinds of thievery, and yet there are many ways in which the short weight has been used in dentistry. For a dentist to establish and maintain a successful practice, it is necessary that he accomplish something that is worth while from a monetary point of view. In the beginning of professional services for each patient a dentist should continually have before him as his motto "Thoroness to a Finish."

There are also many dentists who fail to understand that financial credit is based on character and reliability. Such men suppose that financial credit is based wholly on property or capital. They do not seem to understand that character and reliability, combined with an attitude for one's profession and a disposition to work hard, are far more important assets to have in the business world than millions of dollars without them. Integrity is surely the dentist's capital. It gives him credit, safety, and power. It also makes him high-minded and gives him high aspirations and high ideals.

SECOND POINT—INITIATIVE.

Before we can accomplish anything that is really worth while, we must see clearly what it is we want to do. Even the desire that we call "ambition" and the energy that we call "initiative," powerful as they may be, are wasted if our endeavor is without a well-defined goal.

We should remember that no great achievement, from building a house to painting a picture or reconstructing a government, was ever completed until after it had existed as a finished product in the mind of its creator. We know that the mental picture, at least, must precede the drawing in outline, or even the simplest plans and specifications. Accordingly, it is easy to see that the more perfectly the mental picture is formed, the more accurately it can be followed—the more perfectly reproduced.

It is for this reason that those who are anxious to succeed should practice the art of visualizing—the art of painting mental pictures so accurately or graphically that it seems as if they might exist thru the sheer force of their own expression. When the plan has once been developed, however, the next thing is to put it into execution, and it is here that the idle dreamer fails. In fact the "planning" is the easiest part, and will mean but little if we do not succeed in visualizing clearly, or painting our mental pictures so enticingly that we may become imbued with a strong desire to make them a reality.

Initiative Must Be Irresistible.

It is no weak, half-hearted determination that will produce this result. The desire that rouses the will to action that we denote as "initiative" must be so ardent, so keen, so determined as to be practically irresistible.

If you have an idea, don't be afraid

to try it out. More good ideas in dentistry perish than ever see the light of day, just for want of action. When a good idea strikes you, foster it. Don't wait for a more convenient time, don't be talked out of it, TRY IT OUT.

Premature action—Carefully Investigate and Study Each Idea or Plan.

Trying out an idea is first of all investigating it. The wise man will study well each new undertaking before he engages in it. He will weigh very carefully the chances of success over failure and then decide, and once his decision is made, he will stick to it. There will be no turning back, no weak vacillation, but a determined resolution to put the thing thru to a successful conclusion. And let it be remembered, new things do not usually succeed at the start. There is generally a great deal of disappointment and grief mixed up with them before they are made to go. Here comes the test of pluck. The average dentist lets go too soon. Discouragement and disappointment force him out.

It is the man who says "I will," and who means it, that succeeds in accomplishing the great deeds of the world.

The first essential of a successful dentist is to have a definite program of action, coupled with determination to carry it out to a finish. The man who succeeds is invariably compelled to press on and on by something within him that tells him he can. He has this something which we will call "Initiative."

It is thru the power of concentration only that we can accomplish the results that we aim to obtain; therefore our third point is

THIRD POINT—CONCENTRATION.

In almost every instance those who rank as human failures are individuals who have never mastered the art of concentration. Instead of keeping their minds fixed on a single purpose to the exclusion of all others, they think about a dozen things while they are trying to do one and so dissipate their energies most hopelessly. In a word, "concentration" in dentistry is the cooperation between mind and muscle, and until this has been brought about, even a moderate success proves impossible of attainment.

Physical Labor and Brain Work Must Cooperate.

We speak of "physical labor" and "brain work" as tho they were two entirely different things, whereas in reality nothing that we do is so unimportant that the two should not cooperate in its performance. Even the simplest act that we perform makes its draft upon the brain, and success in doing things depends largely upon the degree of attention given to it. To perform any professional work, we must concentrate on what we are doing.

Every thought means the expenditure of a certain amount of energy, a fact that makes it easy to understand that a great amount of such energy must every day be wasted by those who do not comprehend—or at least do not obey—this law of nature. Instead of making muscle and mind work together, the mind is permitted to work in one direction while the body is working in an entirely different direction, and twice as much energy is expended as would ordinarily be required.

Object Lesson.

Go to a gymnasium where there is a lifting machine and see how great a weight you can lift. Turn your attention to the work. Think of absolutely nothing but your determination to exert every ounce of strength that you possess. Make a record of the weight you have lifted under these conditions; then try the experiment again. This time, however, let your thoughts wander to every corner of the universe to which they may be tempted to stray. If you can persuade someone to talk to you all the time you are lifting, so much the better. The attention is easily distracted

when there is no definite effort toward concentration. Lift the machine when in this frame of mind; then compare the two results. The difference between them is the lifting power of concentration. Such results show why it is necessary that we should think about the things we are doing—they make us comprehend why it is impossible for anybody to do really good work automatically.

To test the strength of your power of concentration, set your mind upon some specific object and see how long you can keep it there—how long you can prevent it from wandering to other objects. Take a lead pencil and see if you can whittle it to a neat, sharp point without your mind's once turning to any foreign subject. You may deem this too easy to try, but unless you have given considerable thought to the principles of concentration, it is doubtful if you can do it. Before the task has been half completed, you will be surprised at the number of things that have popped into your mind, and if this is true, it is time you should begin practicing some simple, mind-strengthening exercises.

Lesson From the Ant.

"If you want to see a living example of concentration of effort and energy, study the ant. Nothing distracts his attention from the task upon which he is engaged. If you thrust an obstacle in his path, you may check his progress for the moment, but you can't make him forget the one object upon which his attention has been centered, for the instant he has overcome the obstruction you have prepared for him, he will return to his work with renewed vigor as if he felt the necessity of making up for lost time.

"Once the ants have found out what there is to do, there is no idling over the task. When they begin to work they keep steadily at it until nothing more remains to be done. They find ample opportunity to eat all that is good for them and they get to bed early enough to get plenty of sleep. They even have their favorite forms of recreation, and when they play or go off on pleasure excursions, they make it their business to have all the fun they can; but when they work, they work and do not stop to wonder how they are going to succeed."

Confidence in Our Ability.

There is one word in the English language that should be avoided most assiduously by those who hope to succeed. That is the little word "if." Introduce the word "if" into the conversation, and its effect is felt immediately. Instantly the element of doubt presents itself—at once the possibility of concentration becomes impossible.

Self-Confidence.

It is desirable that we possess that self-confidence which is distinguished from self-conceit, and which gives us a just appreciation of our own ability and a genuine incentive to concentration. It is thus that the law of concentration operates.

"Concentration" in the commercial world means "attention to business" and the man who possesses this faculty—other things being equal—is the man who is most likely to succeed. There are some men who are able to do several things at the same time and are able to do all of them well, but that is because they have their mental powers so thoroly under control that they can instantly change their point of attention from one subject to another. This brings us to our fourth point.

FOURTH POINT—ATTENTION.

To give proper attention to dentistry, we must get into thoro harmony with the work we have to do. Emerson once said, "We must be lovers and at once the impossible becomes possible." This is but another way of saying that a man who is in love with his work is capable of achieving results that never could be attained by those who performed the

same kind of labor from motives in which self-interest played the commanding part.

Carlyle tells us that genius is the capacity for taking pains, and his words might be used to help in formulating a definition for success, for the degree of success attained invariably depends upon the amount of pains the individual is willing to take with his work. If he bestows a great deal of care and attention upon every detail of the task, he is certain to succeed—to some degree at least.

The alert, attentive mind is of far more value in the commercial world than the slow-moving absorbed mind. The latter may make fewer mistakes, but it misses more opportunities. It lacks the initiative that is derived from physical energy and self-confidence.

There are several laws in nature that are as inviolable as the law of gravitation, and one of these laws stipulates that nothing shall stand still. In accordance with this law every day of our lives finds us richer or poorer, either a little further advanced in the fight for success or a little further down the hill.

The other law is the law of attraction, by which like attracts like, and the two operate together to produce what we term our "good" or "evil" fortune. In other words, the dentist who gets into the right path and travels the right way finds things smoothed out for him. The greater his success, the more comes to him, and the blessings keep on coming as long as he continues to do the right thing in the right way.

One condition that we must observe is the necessity of working as persistently as possible towards one end, for no amount of hustling on our part will make up for the scattering of our efforts. To win, we must select a target and aim at it as straight as we can, not shoot at a tangent in the hope of hitting the bull's eye or some other fellow's target. This is in strict accordance with the law which provides that you will get ten times as great a result if you center all your forces upon one thing as you will if you distribute this energy among ten entirely different things.

Fifth Point—Faith.

No element either mental or physical, plays so important a part in promoting success as faith, our fifth point. With faith as an actuating motive there is practically no limit to the possibility of human attainment. Without faith, on the other hand, next to nothing can be accomplished.

To be successful, a man must have faith—faith in his own ability to perform whatever he has undertaken, and faith in the character of the act, or the purpose to be accomplished. If he does not possess this positive force, he is practically powerless. He may have the plan, he may have the desire to make that plan a reality but without faith he lacks the force to enable him to proceed.

Doing the Impossible.

If you could make a study of the life of any really successful man, you would doubtless find that faith and self-confidence had played the most conspicuous part in shaping his career. Take, for one example, Cyrus W. Field's success in laying the transatlantic cable. Nothing daunted by the fact that all the world viewed him as a half-crazed visionary, Mr. Field persisted in preaching the practicability of his project. Snubbed right and left and with doors closed in his face, he pushed on day after day, until finally the tide turned as it always turns when ability is backed with faith and persistence. Men became wiser. They began to see that they might have been mistaken, and at last some individuals were found to advance the capital needed to start the undertaking.

It was accomplished thru a faith and self-confidence that breeds persistence. No other qualities in the world would have stood such a test. Of course, Cyrus W. Field was prepared for the

work. He had made his plan, and he knew how it could be realized. In his mind the cable existed long before he had raised a single dollar of the money that finally laid it.

Philosophy teaches us that a strong purpose—a determined desire that recognizes no defeat—soon finds a means to accomplishment, which is but another way of saying that, given faith and persistence, all things become possible.

Patience—Vital Factor.

Great as this force may be, however, the very fact that patience or persistence is so vital a factor to success, makes it obvious that we must not expect that our ambitions are to be realized at once, no matter how much faith we may have in them, or how consistently we may urge them.

Getting into a stew because the things we want persist in hanging fire, does not help us. It does no good to lose our temper and swear at our ill-fortune.

At the same time, it is necessary that we should remember that there is a great difference between the patience that comes from contentment and that which is due to satisfaction. "Contentment" is the one element in life that is absolutely necessary to happiness. It is "satisfaction," that dwarfs our future effort, that prevents us from seeking for things that are better than those which we now possess.

When a man is satisfied to stay just where he is, there is no place in the soul of aspiration. The opportunity may knock at his door every hour of the day and night; he slumbers on as peacefully as a dead bug in amber."

Contentment, on the contrary, is vitalizing, for it does not in any respect detract from the strength of the desire to push forward to something higher.

The day we become satisfied with what we have attained, we stop—so far as we are able to stop—the vibrations that make for life. On that day we write the word "finis" to our list of achievements—from that moment the process of disintegration and decay begins.

All this teaches us that there is a force within us that makes for success. You can dam the brook but it will overflow the dam if there is no opening thru it. To keep the water from reaching the goal for which it started you are obliged to build a reservoir and supply it with pipes as outlets for the water that feeds it.

This is a good illustration of the conditions that exist when a man starts in the right way to accomplish something that he believes to be worth while. You may put obstacles in his path, but he will go over them, thru them, around them, for you can depend upon it that the right kind of a man will find the right way to get the better of the most stupendous obstacle which you can set in front of him.

Faith is the hand reaching out to lay hold upon the invisible. It is by faith that invisible things or ideals become real to us. Faith is an absolute necessity to every man who would live; without it we would get no food; we would develop no strength; we would do nothing but die. We cannot live mentally without faith. We cannot think thru anything without having to accept something that we cannot prove. Every truly great life has been a life of faith.

Look at the chronic doubter. Is he doing anything worth while? Will he ever do anything worth while? He can shake his head; he can throw cold water on your good impulses; he can offer a thousand and one objections to your plans. But will he build any bridges? Will he make two stocks of corn grow where one grew before? Will he invent anything? organize anything? establish anything? Will he lead a forward movement? Will he set his heart on anything? Will he endure with patience? Will he buy at the right time?

Or will he sell at the right time? Will he invest in anything? Can any man by any possible chance be anything or do anything unless he has faith?

If men did not believe in the improbable and unreasonable, we should never have had the ocean cable, the telephone, the X-ray, radium, the flying machine, or wireless telegraphy.

It has been and will continue to be true that the progress of dentistry will be according to the faith of its leaders.

To take the raw opportunities that come to us and mold them into a definite success, it is necessary that we should retain in our make-up a certain amount of egotism. We must, at least, have sufficient strength of character to be able to defend our work when we know that it is good. Thus our sixth point is —Self Reliance.

SIXTH POINT—SELF RELIANCE.

The successful man is invariably a self-confident man, sometimes almost an egotist. You may not approve of all his methods, but there is no "folly of doubt" in his blood. When he puts his hand to the plow there is no turning back until the end of the furrow has been reached. Belief in himself makes him strike with confidence. There is no doubt, no half-heartedness in such a blow.

There are two ways in which a thing may be done: the right way and the wrong way. The right way goes straight to the point, accomplishing the maximum result with the minimum expenditure of effort; the wrong way falters as if uncertain as to the direction to take, with the result that both time and energy are lost in debating a point that might otherwise be settled in an instant. Thus, many men have failed, not because their ideas were not good, but simply for the reason that they lacked the self-reliance necessary to put them into operation.

It is strength that wins in the commercial and professional world today—the strength that is inspired by confident reliance upon ourselves and upon the purpose upon which we have bent our efforts. Strength such as this comes from positive thoughts and positive methods. Weak people always lean heavily upon others. They borrow other people's methods and yet contribute none of their own. Given an opportunity to make good, they are usually afraid to accept it. Fearful of the possibility of failure, they have not sufficient love of self, or respect for self, to give them the strength to win.

Self Reliance Has An Air of Its Own.

Self-reliance is the wise, healthful trust in ourselves that gives us the power to fight life's battles successfully.

Pride, like egotism, may easily be carried to excess, but like egotism, it too is necessary if we are to lift ourselves out of the commonplace ruts of life. It is pride that helps a man put a proper valuation on himself. We may not go so far as to assert that it is the clothes that make the man, yet, however generous and charitable we may strive to be, we must admit, if we are honest, that carelessness or slovenliness in the matter of attire invariably leaves a most unfavorable impression. It is pride that insists that the cuff shall be clean. It is pride that brushes our clothes and polishes our shoes.

The man who values himself highly never commits mean and degrading acts. He thinks too much of his own pride to be dishonorable to others.

If the man is content with small things like the mere living, he can stay where he is and let the procession go by, but if he has a reasonable amount of pride and egotism, he is not likely to remain at the bottom very long. Few of us like to feel that others are enjoying the cream of life while we have nothing better than onion soup for our portion, especially when we too may have the best of everything—if we are willing to work in the right way.

Take all the mistakes that we are

likely to make in life; bunch them together and multiply their combined force by three; the evil effort produced would still fall short of that which is exerted by a discouraged state of mind. Discouragement is another word for "letting go". To "let go" means to stop trying. When we become discouraged, therefore, we stop trying—that is all. But, could anything be worse? Now we come to the

SEVENTH POINT—COURAGE.

Courage is the fundamental fact for success. It makes us strong in doing what we have resolved upon.

Courage gives persistence, banishes weakness, replaces vacillation with steadiness of purpose, resolves doubt. It makes hesitancy and irresolution impossible. It sends us armed with confidence upon our road to success. Confidence and the expectation of success draw to us all the qualities and mental forces which contribute to success. Courage, therefore, is the vital element of success.

Courage creates a resolute, influential, strong character, a determined will and a commanding force. It secures respect for our aim, and confidence and interest in our purpose. There is nothing that will so overwhelm a man with disgrace and humiliation as the lack of courage. In the soldier it exposes him to every expression and experience of the contempt of his fellows. He is despised and avoided. Courage is will; it is determination that is unflinching. It is the power that achieves.

Courage implies thoroness, forethought, deliberation, and tact. Courage is identified by actions rather than by words. The resolute, unhesitating way with which a bull-dog attacks is an example of the brute force of courage. Yet, the bull-dog exercises a great deal of intelligence in his methods, not because he fears for his existence, but because he seeks success. He goes right to the heart of things. He attacks the vital part. Courage is indeed the exercise of all the faculties.

The antithesis of courage is fear—cowardice. The man without courage is fearful, a coward, craven. "Fear makes you doubt the likelihood of the success of your enterprise. It weakens your arm for the blow. It narrows your mental forces. No slavery is so absolute as the slavery of fear; no shackles so heavy as those fear forges."

The courageous, unhesitatingly push forward where others tremble, falter, and hesitate. Clear determined thinking is a force of the highest value, but is only possible to the courageous mind.

The worth-while achievements of every day life everywhere are accomplished after it has been demonstrated that they cannot be done. You are a force and a law in yourself. Just the moment you allow yourself to be swerved in your course you begin acting on another person's thought, the motives and mainsprings of which you do not control. You surrender to his direction. Be absolutely free from fear of every kind—fear of want; fear of poverty; fear of sickness; fear of anything. Such fear saps your strength at the very outset of your effort. Fear of all kinds must be banished from your mind. Fear of criticism of imperfect methods destroys the value that such criticism might have for you.

Fret and worry are the moth and rust that corrupt our strength, and fear is the thief that breaks thru to steal our purpose. To believe that you can do a thing and to have the courage steadily, confidently and persistently to live up to that belief, is to go far and to achieve much. Nothing that is of real value is ever achieved without courageous labor.

First Requirement—Act Deliberately.

To acquire the kind of courage that is so necessary to success, the first requirement is to learn to act deliberately. The very fact that we hurry indicates that we are afraid of something—afraid

that we will be too late or that others will obtain more than their share. This brings us to our

EIGHTH POINT—ECONOMY.

It is not an easy thing to practice economy in these days, for there probably never was a time when there were more, or greater enticements designed especially to separate a dentist from his money.

Andy Gump's recent unwise investment in canary birds has been duplicated many times by many men in dentistry. And I notice in today's paper that Mr. Slick has persuaded Andy to pawn his life insurance policy for another $1000.00.

It is not only because of the almost inevitable appearance of rainy days that economy is one of the most important factors in the attainment of success, for while a bank balance is advantageous in helping to keep the wolf from the door, it is just as useful in enabling us to meet and take advantage of the opportunities that may prove to be the open door to greater attainments. The literature in biography is filled with the stories of men who have started with a shoe-string and have afterward achieved success, but if you were to read these narratives closely, you would see that the "success" did not come until after they had passed thru a period of carefully fostered economy.

Many dentists who pride themselves upon their ability to be economical are actually spendthrifts when it comes to the matter of mental and physical strength.

Industry is commendable, but there is such a thing as working too hard, and the most industrious men often become spendthrifts of energy. They do not ask the question, "Can I afford to do this? Can I afford to take this task home and extend my working hours far into the night? Can I afford to forego the pleasure and relaxation that the visit to the theatre would give me? Can I afford to relinquish my chance for a vacation?"

We are very apt to debate these questions exclusively from the financial point of view, when as a matter of fact the monetary argument should not always have the greatest weight. There is no profit in doing two men's work, even at two men's pay if all the money earned is to be expended in paying for the service of doctors and nurses. Death is a big price to pay for the privilege of working overtime.

It may cost you a good many dollars, that vacation trip you have planned, but—never fear—the dollars will be well spent. You will return in good condition to recover far more than the amount you can possibly spend. It isn't merely the fact that a man is absent from his office that counts. It is the change of scene, the different atmosphere, the opportunity to see new faces, the ability to enlarge one's view of things. The main thing to be remembered is that all work and no play will make us dull.

Waste of energy is quite as serious a handicap in the struggle for success as the waste of money, and if there were but some way by which we might ascertain the amount of energy that is wasted by each one of us every day of our lives, we should unquestionably find the true explanation for our failures.

The very act of losing the temper is one of the most wasteful expenditures of energy that it is possible to conceive. The dentist who rushes about as if the safety of the universe depended upon his individual effort—who gets excited and flurried if everybody does not heed his beck and call—does not begin to attain the results that are attained by the dentist who calmly, quietly, and intelligently works on to the logical conclusion of his labors.

Failure Often Due to Haste—Keep Peace of Mind.

Everything that ever has been done well has been done calmly. Many things that have been done badly owe their failure to haste, or lack of calmness, with which they have been performed.

These are some of the phases of economy—the economy that those who would succeed should practice—for it is only by conserving all our resources that we can hope to rise above the limits of mediocrity in any field of human endeavor.

NINTH POINT—TEMPERANCE.

To those who have attained years of maturity the maintenance of the physical equilibrium may seem a very commonplace thing. However it was by practice that we learned to stand erect. It was by practice that we learned to walk just as it was by practice that we have discovered the best way of performing many other feats that are required of us. Yet, with all this practice, what a little thing it takes to make us lose our balance. Any persistent divergence from the path of normal living is intemperance and may accomplish our downfall.

No Practice Should Be Carried to Excess.

To be truly temperate, it is necessary that no practice shall be carried to excess. Competition in the race we are running is so great that no one can afford to put on the additional weight that a bad habit necessitates. Looked at from a purely selfish point of view, and without regard to the ethical aspects of the question, no one has so certain a prospect of "walking away from the field" that he can take the chance of failure that such a handicap entails.

To attain a success that will be to any marked degree permanent, it is necessary that there should be a healthy mind as well as a strong body, and anything that has a tendency to weaken the mental or physical condition is a serious violation of the law of temperance.

Simple Handicaps—Drink—Gluttons.

There are many ways in which we can impair our own usefulness. Some of them may seem very simple handicaps—yet if we study them carefully we are certain to find out that, after all, they seriously interfere with our efficiency. For example, there are people whose appetites are largely responsible for their lack of success in life—not the appetite for strong drink alone, but the appetite for food as well. I know dentists who eat so heartily at luncheon that they are good for nothing for several hours. It takes all their vitality to digest their food; nothing is left to keep their brain active.

Others smoke too much; some play too much; many waste their time in profitless conversation; not a few are the victims of bad disposition, for any habit that may make trouble for us, that may cost us something that we desire to possess, or that interferes with our advancement in life—is nothing more or less than a handicap and should be cast off as expeditiously as possible.

A comprehensive definition of the word "temperance" must include our thoughts and emotions. For it is only thru obedience to the law of temperance that man can establish his reign over the kingdom of self. The gift of individuality is perhaps the greatest blessing of man, but to retain the sovereignty that has been bestowed upon him, he must retain his control over his kingdom in thought and word as well as in deed. By giving way to the passions he steps down from the throne and permits his emotions to take his place. From a king he descends to the rank of a slave—a slave to the passions that he himself has fostered.

In brief, true temperance is but a synonym for perfect self-control and while the control of self alone may not be the great secret of success, it makes

the way to the attainment of our highest ideals so smooth that there is nothing to check our progress.

TENTH POINT—COMPENSATION.

This brings us to our tenth point which is that there is a law of compensation in life—a law that stipulates that you are to get what you deserve, no matter on what side of the ledger the balance stands. For every right action you are blessed; for every wrong action you are penalized. The reward may seem slow in coming, but never fear. It will come, and when it comes, the reward or punishment will be just as real as the original act was real. The Biblical promise that "to him that hath shall be given, and whosoever hath not, from him shall be taken even that which he seemeth to have" holds true today, and the sooner we recognize the nature of the principles that govern success the more readily attainable it will become.

In a word, the passage teaches the important truth that the only way by which a man can become a power in the world is to be capable of having and holding the things to which he aspires. It means that the money, the authority, or the ability, that we desire to possess will be given to us in accordance with our capacity to use it, and that if we prove incapable of making good in small opportunities, the little chances that are given us in order to test our strength will be taken away.

Each person is permitted to climb as long as he exhibits the necessary strength. As he ascends, new and greater opportunities are given him, and it is only when he fails to take advantage of them that his chances cease.

Another principle that is so intimately interwoven with the law of compensation that it is practically but another phase of the same statute is what may be termed "The Law of Reciprocity."

In every plane of creation, from the lowest type of plant life to the highest type of animal life, everything is created for a purpose, and that purpose is as much one of giving as it is one of receiving.

Selfishness is as destructive to man—tho to a different degree—as it is to the plant. To be healthfully successful we must also give as well as get. It is just as impossible for a man to keep on taking in without giving out as it is for the plant to absorb without exhaling.

It is here that many dentists make their gravest mistakes and so turn what may have been a great success into an ignominious failure.

There is danger in the dawn of prosperity that adversity never presents. There is the temptation to stop pulling—the temptation to rest on the oars, and make the most of the few advantages that have been gained. There is also the temptation to become avaricious—to want all that we can obtain and to begrudge giving what the law of reciprocity demands of us. As success is a matter of adjustment, failure will soon follow if these sins against the law are not quickly pruned away.

Compensations Everywhere.

When I started in practice, I used to be somewhat worried by the good fortune of incompetent and wicked men. I saw men who worked half as hard as I in some instances massing fortunes. I saw how so-called society and funny stories put some men in the good graces of influential business men.

But I have lived to see the law of compensation get in too much deadly work ever to concern myself any more about anybody else's success.

I have seen good fellows who have thought they were perfectly secure in their exalted positions come tumbling down from their high pedestals. I have seen men grow very rich; and there are many ways that the law of compensation works, especially when a man has as his motive to become very rich. It makes him pay in health. It can turn his home into a counting-room—a miser's

den. It can make his children snobs and hypocrites. It can destroy his joy in simple things.

No Exception to This Law.

There are many seeming exceptions to this law; but the longer I live, the more sure I am that, if these exceptions were analyzed, they would be found not to be exceptions at all.

There is no such thing as perpetual motion. No man ever for very long, gets more than he deserves without paying for it something as valuable as he gets.

"Nothing can work me damage but myself", said St. Bernard, "the harm that I sustain I carry about within me, and I never am a real sufferer except by my own fault." "Success is a straight problem in sowing and reaping. Luck plays no part in it. Everything depends upon how you work."

It would seem to us that to secure real success in dentistry, it is imperative for one to know and practice the ten laws of success as outlined above.

ELEVENTH POINT—SOCIALIZING THE DENTAL PROFESSION.

However, organized dentistry should hitch its wagon to certain stars, and in point eleven we will discuss socializing the dental profession.

Edward F. Brown, Superintendent, Bureau of Welfare of School children, recently said:

"To the dentist who looks upon his profession merely as a means of profit making, regardless of all else, we may say he is sadly lacking in professional ideals. We do not begrudge him an adequate payment for the work he does. But disease must be wiped out at all costs, regardless of the incidental inconveniences and sacrifices which will be encountered. Disease is a social menace, an enemy of the state. The doctors and dentists must protect us from distress —not because we have the money to pay therefore, but because it is right that it should be done. The socialization of these professions and the promotion of health, are charges which the state should be glad to liquidate, for health is essential—it is the keystone of life."

Man's evident failure to make the most out of his material life suggests a study of the elements in each citizen that make him of value to his age and community. What are the measurements of mankind? Many and varied estimates of man's value have been made.

Statisticians reckon the average man's value at $600 a year. Each worker in wood, iron, or brass stands for an engine or industrial plant worth $10,000, producing at six per cent, an income of $600.00. The death of the average workman, therefore, is equivalent to the destruction of a $10,000 mill or engine. *The condemnation of a man's life* is that he consumes more than he produces, taking out of society's granary that which other hands have put in.

The praise of a man's life is that he is self-sustaining, taking less out than he put into the storehouse of civilization.

A man's original capital comes thru his ancestry.

A great measure of a man's value to society is found in his original endowment of physical strength. The child's birth stock of vital force is his capital to be traded upon. Other things being equal, his productive value is to be estimated mathematically upon the basis of physique. Fundamentally man is a muscular machine for producing the ideas that shape conduct and character. All fine thinking depends upon fine brain fiber. To spoil a time piece is not necessary to break its every bearing; one loose screw stops all the wheels. Likewise a very slight error as to the management of the bodily mechanism is sufficient to prevent fine creative work.

What shall we do about the neglect of the children who hold the future of civilization in their immature lives?

For let it be said again, the foundations for enduring soundness of the

nation must be laid in provisions secured for the health and welfare of the children.

A dollar spent promptly in a timely, constructive effort to conserve a child's health will be more fruitful for the child and for human society than will a thousand dollars applied twenty years later. The principle of national thrift finds its first and most vital application in the conservation and improvement of the health of the children.

The business of keeping the school children of this country in good physical repair is, as now conducted, a disgrace to the nation.

The children of our country deserve as effective physical care as the live stock. The children are entitled, even in war times, to as careful attention and cultivation as the crops.

Shall not the children, drafted by compulsory education into our schools, be assured of as skillful and satisfactory care as the soldiers in camp and trench?

Is A Child's Life Worth Six Dollars?

How much does it cost to prevent deaths from diphtheria? *The Ohio Public Health Journal* for February, 1919, gives the experience of the city of Salem, Ohio, for twenty years. During the ten years from 1890 to 1899 this town of about 10,000, the inhabitants had 162 cases of diphtheria with forty-eight deaths, or 30 per cent. In 1900, the city health authorities began furnishing free antitoxin for all cases of diphtheria. In ten years, from 1900 to 1909 there were 126 cases, with only one death, a case in which antitoxin was not administered until the third day. The free antitoxin furnished for the ten years cost that city an average of $6.00 per life.

The Chicago *Tribune* the other day had this significant editorial:

"The finance committee has reversed the order of race preservation. The law of life is that youth must be saved. The old must die and the young must live. But the thrifty legislators in the city hall seem to have forgotten this unbending law; they take from the children that political jobs may endure.

"The committee has entirely abolished the appropriation for dental examinations in the schools and has reduced the appropriation for physicians and nurses. This is done in the face of a report that a large percentage of Chicago school children are victims of undernourishment and malnutrition..

"Dental examinations in the schools are necessary to the public health. So are the visits of school physicians and nurses. There are few things in the city budget that we cannot afford to sacrifice for the sake of these. The finance committee had better wake up."

I maintain that the responsibility in no small measure for the lamentable mouth condition of school children, and lack of interest manifested in this work, rests upon the dental profession. For as a profession, we have failed to take the proper individual and organized leadership in this great educational work which is primarily our job.

I never discuss this problem and our responsibility to the child but that these lines come to me:

"There is a Reaper, whose name is Death,
And with His sickle keen,
He reaps the bearded grain at a breath,
And the flowers that grow between.
"Shall I have naught that is fair? saith he
'Have naught but the bearded grain?'"

"Naught", I say, for the flowers are not for the harvest, but for health, and I like to think that I am in a profession that is going to assume the burden of responsibility of dispelling this sin of ignorance toward the child.

The American Journal of Public Health reports that "Publicity properly applied will save more lives than any other single agency employed by health workers. It should be entered in the Public Health Pharmacopoeia as an

accredited remedy for human ills. It is being applied to individuals in capsule doses of public education.

"Publicity prevents tuberculosis and dental diseases and builds hospitals and infirmaries to cure them. It saves the lives of children and adults and controls epidemics of smallpox. Thousands of babies are today alive in the United States, largely because big doses of publicity were administered to the public by health, thru exhibits, newspaper articles and lectures."

Publicity Dental Service—The Other Eighty Per Cent.

Time will not permit us to discuss publicity dental service—for the other eighty percent, except to say that the establishing of dental school clinics—public dental service as represented in great dental infirmaries like the Eastman and Rochester, and also the establishment of industrial dental clinics—will be important factors that will help the dental profession to render in at least a small way some signal service to the other eighty per cent who are not now receiving proper consideration.

This brings us to the

TWELFTH POINT—PUBLICITY.

All plans inaugurated by the dental profession looking toward the education of the public should be coordinated and systemized in a well-defined policy so that we may have a united profession and, thus, the tremendous backing of the individual dentist and of organized dentistry. The dental profession, since 1913, has successfully organized into an army of 27,000 members, the greatest professional organization in proportion to its available membership, in existence. It has also successfully launched and permanently established its own mouthpiece—*The Journal of the National Dental Association.* The dental profession has now arrived at the cross-roads where it must take the initiative and the leadership in all public dental educational work. And foreseeing the necessity of a well-defined plan for publicity or public educational propaganda, The National Dental Association has appointed a committee to formulate plans for a new organization or section, under the auspices of that Association, probably to be known as the American Mouth Hygiene Association. This committee will make its report at the coming meeting in New Orleans. It is planned that this new organization will functionate thru the office of the General Secretary of the National.

Briefly, this organization will have a well-defined plan of publicity thru an agency which will reach 26,000 newspapers and magazines in the United States. It will also outline a variety of lectures to be given before various groups of school children of educators, of the general public, etc., and a large number of classified slides for these lectures as well as motion picture reels are now being collected for this purpose. A large number of booklets and literature of various kinds are being written for distribution of welfare and habits are being prepared so that all ages and races may receive proper instruction in mouth cleanliness. Special lectures will be available and men who are now editing health columns in various newspapers will be kept posted on scientific advancement in dentistry so that the proper education may be given to the public.

THIRTEENTH POINT—STUDY CLUBS.

The thirteenth point, which we should like simply to mention, is the importance of concentrated educational work, which will mean a more serious study on the part of the individual dentist. We know of no better method than the organization of study clubs. There are many groups of men that should band themselves together for special work along definite lines. Thru such small organizations we should be able to do definite research work that will continue to raise the educational standard of dentistry.

Many dental societies have already done commendable work in inaugurating various plans of so-called post-graduate courses. Any educational plan that will continue to develop the brain and technic of the individual dentist is worthy of serious consideration and should receive the support of organized dentistry.

FOURTEENTH POINT—DENTAL EDUCATION.

The fourteenth point is the dental educational problem, for the point of contact between the present and future of dentistry is the dental student, and therefore the responsibility for the educational advancement in dentistry in no small degree rests on the work done in the dental school. The dentist of tomorrow who must be depended upon to raise the educational standards of our profession is today being trained for that work in our dental colleges. It is a Herculean task and almost an impossibility materially to raise the standard of dentistry by any efforts or plan of education inaugurated among men who have already graduated and are now in practice.

In our educational work, we must not overlook the fact that the American dentist has been and is today recognized as the peer of any other dentist in the world. There are other countries that probably require of candidates a longer period of preliminary education, particularly a better training in medicine before taking up dentistry but these men, it would seem, invariably fail to measure up, except in isolated cases, to the standard of the American dentist. Therefore, any educational plan suggested looking to the raising of the standard of dentistry should guard carefully the fundamentals that have stood out as the essentials in the making of the American dentist. We must not drift too far from our moorings or our well-established principles in dental educational. Our first duty to every man studying dentistry is to make out of him a real dentist, and no additional subject should be included in a dental college curriculum that would curtail or reduce the time given to fundamental subjects and necessary clinical work to make an efficient practitioner. Therefore, it would seem that any additional plans contemplated for the advancement of dental education should be conservative and *hew* closely to those basic principles that have made dentistry what it is today—paying particular attention to mind and technical training and shifting the responsibility of preliminary educational work, or those subjects not strictly dental, to the preparatory educational institutions.

The United States presented to the nations participating in the great world war fourteen points which are now serving as a basis upon which to build a permanent and lasting peace. These fourteen points will ever stand out in the midst of the most charotic condition in the history of mankind as a Washington monument representing the onward progress of the human race towards independence and freedom.

In the same way, it is just as important for the future success of dentistry that as individuals and as a profession we formulate a definite plan and policy upon which to build a successful life and a profession that will forever be increasingly more able to relieve human pain and suffering.

ANESTHETICS IN DENTISTRY.

Special Consideration of Nitrous Oxide and Oxygen; Its Characteristics as an Anesthetic; Its Indications and Contra-Indications in Dental Practice.

By J. P. Henahan, D. D. S., Cleveland, Ohio.

(Read before the National Dental Association at Its Twenty-Second Annual Session, Chicago, Ill., August 5-9, 1918.)

IT IS gratifying to see the enthusiasm with which the dentists of the United States have taken up the practice of Nerve Blocking Anesthesia.

A few years ago it would have been an easy matter to make a census of all the dentists who were producing anesthesia in this manner. Many dentists who, comparatively a short time ago began this practice, have in their enthusiasm turned teacher and are spreading the doctrine until now there are few entirely unfamiliar with the practice.

However, the element of human nature is asserting itself now in the form of prejudice, which unfortunately takes the form of opposition to all other forms of anesthesia. This unfortunate condition should not be allowed to develop, because prejudice is blind and usually expressed in the form of antagonism. Opposition of this kind is not logical because it must be realized that none of the present anesthetic agents or methods can be eliminated; they are all necessary.

It is not the enthusiast in Nerve Blocking Anesthesia alone in whom we note this mental state, we see it also in the man who has had many years of success with older methods of anesthesia, and who stands pat, determined that as far as he is concerned there is no need for further improvement. These are not the men to whom I wish to speak, because it would be a waste of time to attempt to convince a man against his will.

The medical and dental professions are very keen to reap the benefits to be derived thru the use of anesthetics, and great strides are being recorded in various directions for the relief of pain and suffering.

Anesthesia altho well developed today, may be considered as only in its beginning. It is gathering force which will be so great that no such friction as the opposition of any one man, or group of men, can impede its progress.

In medicine the need for anesthetic aid in certain classes of cases was recognized, and in consequence we have recently heard much of Twilight Sleep, Anoci-Association, etc., etc., and they have filled a need which the world has always felt, but has had to get along without.

Dentistry also has wanted for anesthetic aid in certain directions especially operative dentistry, and conductive anesthesia apparently goes a long way to fill the need.

Chapters have been written recording the action of Cocaine, Chloroform and

the other anesthetic agents, general and local, and the many tragedies which have attended their early use. The results of observation and research are now at hand and our knowledge, enriched thereby, warns us of the peculiar danger attending their use.

While we as a profession may be proud of our progress in anesthetics, there still remains much work to be done. Our first duty to the community is the routing out of the laggard and forcing him, by the light of popular opinion, to bring himself up to date. There are plenty of men still who do not attempt to employ any form of anesthesia and still others who attempt to practice anesthesia according to the ideas of thirty years ago; their methods in local or general anesthesia are obsolete. There are those who inject a decoction of something or other containing any percentage, known or unknown, of Cocaine anywhere into tissue of any kind and condition. There are those also who administer Nitrous Oxide by itself and who expect thirty seconds of available anesthesia to suffice for the completion of any operation. These are the men whom the Profession must interest itself in, for they are the only ones who are left, and we must enlighten them if not entirely for their own sakes for the sake of the public and the name of our profession.

In considering methods for the elimination of pain in dentistry we must also consider the nature of the pain or suffering which we must eliminate, and then apply the method of anesthesia which is indicated.

Pain in dentistry may range from that caused by the application of the rubber-dam and ligature, to the removal of a vital pulp or the pain produced thru extraction of a tooth or some oral surgical operation.

The pain following the operation also must be considered and must be treated accordingly as it is of traumatic or bacterial origin.

The selection of the remedy must involve a consideration of many substances and classes of drugs. In this must be included the consideration of dosage, the duration of anesthetic and the method of application.

Much criticism is directed toward Cocaine and indeed this drug always since discovery has been the subject of much discussion. We shall always be anxious to hear the views of those who have something new or interesting to tell. We are perfectly aware of the pecularities and the dangers of Cocaine; knowledge which has been developed as the result of clinical as well as chemical research; but, in spite of all of this we must still consider Cocaine as a very valuable drug in dentistry and medicine, altho its use in dentistry is now reduced to the minimum, it possesses virtues which we do not find in any other local anesthetic drug.

Cocaine is a protoplasmic poison and exerts its influence locally or generally. We cannot tell in advance anything about the patient who presents an idiosyncrasy for this drug. It has been shown that the safest way to administer Cocaine is in perfectly sterile saline solution, in very small percentage not greater than one-half of 1%. This solution should be injected very slowly. It affords opportunity to notice development of the poisoning symptoms when we may desist in the introduction of the solution.

Simply to condemn Cocaine, however, because as an individual we have found a substitute which is satisfactory to us, is not a fair standpoint, and it is not adding anything to our fund of professional knowledge.

In like manner we may consider the criticisms which have been advanced regarding the use of Nitrous Oxide, and Nitrous Oxide and Oxygen. We read many references today objecting to the

use of these gases for anesthesia and analgesia.

When considering the subject of anesthesia, with Nitrous Oxide and Oxygen, we must admit that to become proficient in the use of this agent much experience is a necessity, and experience must be accompanied by thoro study. Besides this the personal equation must be considered and we are aware of the fact that not everyone who attempts this form of general anesthesia becomes proficient or expert. It, therefore, behooves the critic to leaven his remarks with fairness. He should be cautious when he condemns any agent which is in daily use in the hands of thousands of successful operators in the Country.

Besides the nature of the pain to be eliminated in dental operations, the type of patient to be operated upon is an important consideration for the thoroly trained man. In nearly all cases where the patient is likely to suffer pain, it would seem that some anesthetic whether or not it is the one indicated, might be regarded as better than none, but so far we have not found an anesthetic which may be regarded as universal.

One of the chief objects for which an anesthetic is employed is the prevention of shock. Shock we all know may be produced in some patients more readily by mental impressions than thru physical irritation, consequently we must consider any anesthetic which does not overcome this possibility as wanting in this direction, no matter what its virtues may be in other regards.

As a result of research and observation carried on by Dr. Crile and his associates, he has made the following statement:

"Each anesthetic covers part of the field but there is no single agent that alone can produce Anoci-association, which is the goal of operative surgery. We therefore, do not advocate Ether alone, nor Chloroform alone, nor Nitrous Oxide alone; we do not advocate local anesthesia alone nor morphine and scopalomin alone, nor spinal anesthesia alone, but thru selection and combination of anesthetics we aim to attain an anesthesia that will exclude all stimuli from the brain and thereby attain anoci-association."

These statements are like the handwriting on the wall for the Dental Profession. We must be prepared to induce the anesthetic or combination of anesthetics indicated.

The advent of nerve blocking anesthesia has proved to the dental profession the fact that as a body we can carry on a study and achieve wonderful results.

One of the chief reasons for the widespread use of nerve blocking today is the fact that our dental organizations have *as organizations,* given countenance to it and the men who teach it, thereby instilling confidence in the rank and file.

If the study of nerve blocking has produced such wonderful results, then it also is desirable that study be pursued for the mastery of any subject which embodies equally great possibilities.

It would be proper for our district societies, or even the National Dental Association, thru committees, to procure the services of capable and well known men to be delegated to various sections and give post-graduate instruction in the administration of Nitrous Oxide and Oxygen, under the auspices of Local Dental organizations. Great good to the profession and community would result.

The administration of Nitrous Oxide and Oxygen never has been thoroly studied except by a limited number of the dental profession. It should be studied carefully under the tutelage of competent teachers. The man who makes a serious business of it and who studies and observes will gain success and all the benefits which may result from its successful use.

Local anesthesia, or any modification

of it, cannot be regarded as entirely sufficient for the dental profession. There are many instances in which it is contraindicated, both on account of conditions in the operative field, and the type of patient. Young children, neurasthenics and hysterical types often are impossible of operation under local anesthesia because not even the anesthetic can be administered. The anemic and apprehensive patient with lowered vitality and resistance, even tho experiencing no actual pain, often suffers such mental strain as to produce collapse. The otherwise strong and healthy patient who has suffered much pain with loss of sleep, and possibly being in a state of general infection, is not to be regarded as the ideal patient to whom a form of local anesthesia should be administered for the performance of a severe or prolonged operation. A child six or seven years of age who has lost sleep and is fretful suffers much from mental strain while undergoing the difficult removal of a sixth year molar for instance, under local anesthesia, and even tho no actual pain is experienced, leaves the child as fearful of the dentist's chair as if no anesthetic at all were employed.

Pregnant women always should be the object of our greatest consideration. According to the individual we see this class of patients in the most extreme condition of nervousness, and shock must be avoided in all events. Here we find another contraindication for local anesthesia. We must not forget to consider the nursing mother whom we sometimes see in such a state of physical and nervous exhaustion that shock might easily be produced with the resulting suppression of the secretion of the mammary glands. In all such cases Nitrous Oxide and Oxygen is the anesthetic indicated.

The object of this paper is in no measure intended to retract from one, nor yet to make unreasonable claims for another form of anesthesia; it is simply intended at this time of enthusiasm in connection with something new, to again draw attention to that older form of anesthesia, which has been the standby of our predecessors and which today is more frequently used than ever before, Nitrous Oxide and Oxygen.

This agent has been demonstrated as being the safest of all anesthetics; it interferes less with and impairs less the natural immunity of the patient, than any other anesthetic.

The best students of surgery in the world will be sure to take greater advantage of its use as time goes on.

Recently I have been informed that the British Army has officially prescribed Nitrous Oxide and Oxygen for use in its War Hospitals, being used to great advantage in dressings, some of which are almost equal to a major operation. The frequency with which it may be repeated, brief induction period, absence of after affects such as nausea, etc., are circumstances which influenced its adoption.

Again referring to the writings of Dr. Crile, we see that he believes shock results in many operations because the single form of anesthesia is not sufficient to protect the brain cells from exhaustion. Figure 1.

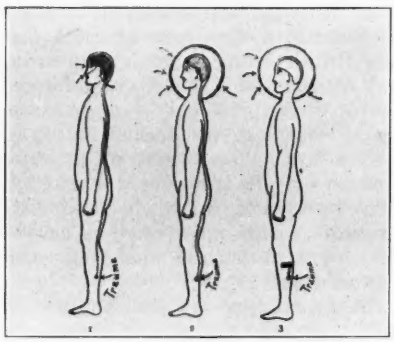
If local anesthesia alone is used, then even tho no real pain is endured, shock is produced by psychic disturbance, and if only general anesthesia, shock results because not only the part of the brain which is not anesthetized becomes exhausted but also the part which is anesthetized.

He recommends and practices a combination of local and general anesthesia, believing that general anesthesia protects the brain cells from exhaustion due to psychic influences and nerve blocking protects the brain cells by blocking the conductivity of the afferent nerve trunks, thereby eliminating all actual irritation from the brain.

If this is good and common practice in general surgery for the removal for instance of an appendix which requires only ten or fifteen minutes of the time of a skillful surgeon, why is it not good practice in dentistry for the removal of a difficult impacted tooth, an operation which often requires an hour and which sometimes is attended by serious shock?

The combination in this particular connection is also followed by very favorable results locally. The tissues are usually not so highly inflamed and if the

Figure 1.



postoperative treatment is somewhat of the same nature, the inconvenience and pain are reduced to the minimum. In other words, we keep the tissues in a state of physiological rest and the brain protected from exhausting irritation.

The objection that experience is necessary to the successful use of Nitrous Oxide and Oxygen is no objection at all. It may be a hindrance for the time being, but should not be considered by the man who really is sincere and whose determination to progress is sufficiently strong.

Conductive Anesthesia is a blessing to the man who employs Nitrous Oxide and Oxygen in that it permits him to eliminate what was a very undesirable feature of practice. It affords a satisfactory anesthetic for Alcoholics, Habitual Drug users, and other cases difficult to anesthetize, without trouble or danger. In this class of cases, usually there is little to fear from psychic disturbances.

Technic of Administration of Nitrous Oxide and Oxygen to the Average Adult Patient.

At the time when a patient is to be given an anesthetic in the dentist's chair, it is supposed that as far as possible all preliminary arrangements have been made.

The patient has been fasting for three hours at least before the appointed hour.

If the patient is a woman she should be left for a short time to the attentions of the lady assistant who gives advice which precludes any embarrassing situation during anesthesia.

All tight collars, neck bands, or excessively tight body lacing should be removed.

It is to be supposed, whether evident or not, that the patient is in a state of high nervous tension.

The patient should be placed in a comfortable position in the chair.

The dentist by action and conversation applies suggestion calculated to quiet the fears of the patient, because as stated before, successful technic for the administration of Nitrous Oxide and Oxygen must comprise also to a great extent treatment of the Mind.

The patient should be shown the easiest position in which to sit;

The feet should be extended but not shoving against the foot rest;

The hands should be resting in the lap not grasping the arms of the chair;

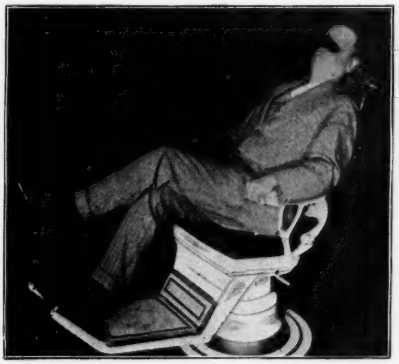
The neck should not be bent backward because this incites a desire to swallow constantly;

It should not be bent forward because especially after anesthesia develops it interfers with free respiration because the chin approaches or rests upon the chest, constricting the air passages in the throat.

The aim is to have the patient in a

comfortable position and then have patient relax completely; pay some attention to this, for if the patient remains tense with muscles contracted, the tendency is to become more so, requiring a much deeper and prolonged anesthetic.

Figure 2.



Wrong position, hands grasping chair, knees crossed.

Figure 3.

Wrong position, head too far back irritates throat.

At the most favorable moment the patient is again reassured, in a very positive manner, that there is no danger and that no pain will be experienced.

Notice privately that your patient breathes comfortably thru the nose with the lips closed, for many patients believe without cause that they cannot breathe thru the nose.

Figure 4.

Wrong position, head too far forward, interferes with respiration after induction of anesthesia.

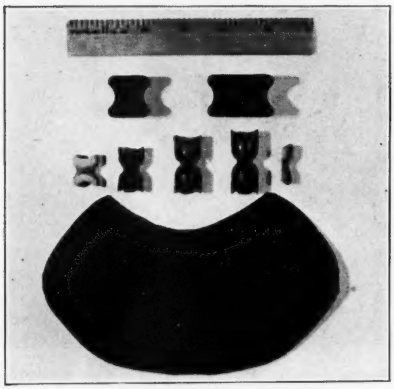
You have determined beforehand what work is to be performed and then you carefully select a mouth prop which will hold the mouth open sufficiently to permit operation but not to such an uncomfortable extent that it causes

Figure 5.

Correct position, patient at ease.

swallowing or interference with respiration. Some types present in whom the lower jaw is short due either to lack of

Figure 6.



Showing relative size of mouth props and mouth cover.

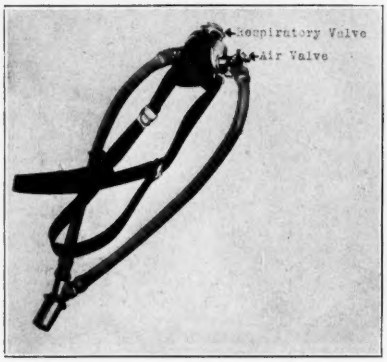
development, or as the result of scalds or burns. In the latter case the cicatricial tissue binds the jaw and limits its action. In any of these cases there is a

Figure 7.

Mouth cover in position before placing inhaler.

tendency toward automatic closure of the air passages when an attempt is made to open the mouth to any great extent. Extreme care must be exercised and intermissions permitted to allow for correction of any respiratory interference after anesthesia is induced.

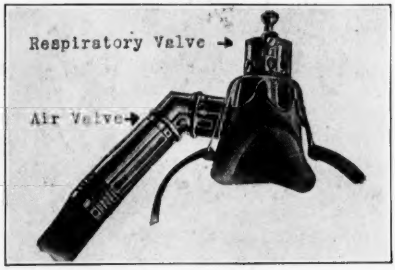
Figure 8.



New type nasal inhaler showing valves.

It will be noticed in many operations upon the lower jaw, that a tendency toward cyanosis will develop; this is not due, as a rule, to incorrect mixture of gas and oxygen, but to partial closure of air passage due to pressure necessary in operation. This condition is eliminated

Figure 9.



Old type nasal inhaler showing valves.

by frequent intermissions and drawing forward of the jaw.

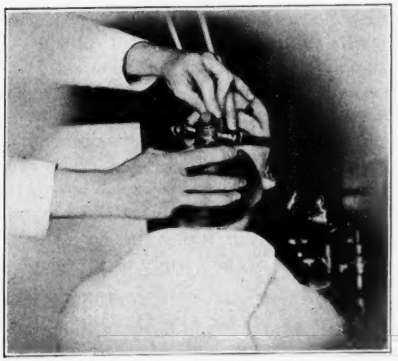
When all preliminary details have been arranged, place a mouth prop of proper size in position and place mouth

cover over the mouth and permit the patient to continue breathing as usual; inform him then that he is doing just what you want him to do, that he is breathing thru the nose.

If the patient shows fear or undue excitement at this stage and the manner of breathing is affected, being either too shallow or violent, say quietly that comfortably deep and regular breathing is what you desire; inform your patient not to talk or swallow. The object is to avoid a feeling suffocation.

Now, examine your nasal inhaler and note that the expiratory and air valves

Figure 10.



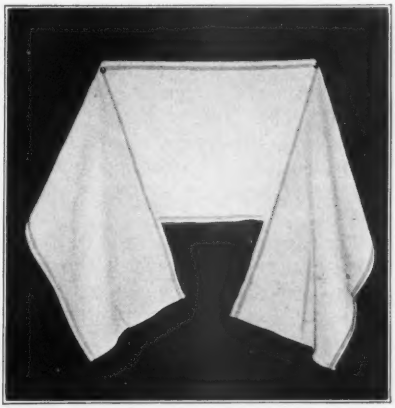
Inhaler and mouth cover in position.

are wide open. This is a very important detail; place your inhaler quietly and carefully on the patient's nose, and after allowing a few moments for patient to become accustomed to it, carefully and slowly turn in Nitrous Oxide gas.

It may be remembered that the patient will, on account of the open condition of the inhaler, be breathing with no more difficulty than before the inhaler was placed, and our object should be not to change conditions suddenly and perhaps cause panic or excitement by allowing gas to rush in suddenly.

As the gas flows into and partly fills the bag, the air valves (not respiratory valves) should be gradually closed. When this time arrives Nitrous Oxide has been substituted for Atmosphere and

Figure 11.



Towel eight feet in length used for restraining purposes.

we must carefully observe our patient for signs which will indicate the neces-

Figure 12.

Patient in correct position for induction of N_2O and O anesthesia with restraining towel in position.

sity for Oxygen. It is not possible to give definite rules for this, as conditions vary with all patients; however, the

majority will be affected in more or less a common manner.

The average patient after inhaling about six full breaths of Nitrous Oxide, will show faint signs of approaching cyanosis and should be given Oxygen. About 8% on an average should be admitted a this time; as the anesthesia progresses more oxygen usually must be added. The Oxygen must be added according to the developing symptoms of the patient and not according to any set of rules, each patient being a problem in himself.

The anesthetist's ear should be trained to respiratory sounds and it should be remembered that while the patient retains any control of respiration, that anesthesia is not profound.

Under the foregoing conditions, about one minute is required to induce anesthesia, and the patient should present an appearance as if in a state of natural sleep.

The color of the skin should be practically the same as before anesthesia was induced.

Respiration should be profound and measured.

The pupil should not be dilated; (should not be more than two or three mm in circumference.)

The pulse should be full but not noticeably increased either in size or frequency.

Mixture of Gasses.

If the mixture of gasses has not been correctly made the patient will present relative symptoms:

First, for want of sufficient Oxygen the patient presents symptoms of a straight Nitrous Oxide Anesthesia, and will become cyanotic due to partial asphyxia, or

Secondly, on account of too great a supply of Oxygen will be unduly stimulated.

In the latter case the patient's color is very red, especially the lips and the lobes of the ears.

The breathing is irregular with possible holding and muscular straining, and if not quickly corrected, the patient becomes excited and possibly troublesome.

If the mixture is correctly made, as evidenced by the fact that the color does not change in one way or the other, but still the patient is not sufficiently anesthetized, then we must modify the technic so as to cause the blood to take up more Nitrous Oxide. This is done by increasing the interpulmonary pressure, in the following way:

The respiratory valve on the inhaler, which up to this time has been working rather freely, is now partly closed, thus constricting the passage for escape of the expired gas, and automatically increasing the internal pressure in the gas system and the alveoli of the lungs, causing an increase in the amount of gas passing thru membranes. The general mixture of Nitrous Oxide and Oxygen is not changed only as the progress of anesthesia indicates the necessity of an increase in the supply of Oxygen.

Technic of Administration of Nitrous Oxide and Oxygen to Children.

In the case of a young child a great deal of judgment is necessary.

Dentists often are called upon by surgeons for aid in minor surgery cases such as adenectomy and circumcision. For children either of these operations are more serious than extraction cases, and may thru nervous reflexes cause, the development of respiratory troubles, and the younger the child the more likely are these symptoms to be seen. Deep surgical anesthesia must be maintained without interruption.

Children less than five years of age generally are not regarded as proper subjects for this anesthetic.

Children from five to fourteen years seem to present a different problem at all stages between these years.

The very young are difficult to control before anesthesia and those about twelve to fourteen very difficult after anesthesia is partly induced.

The youngster oftentimes will not submit quietly and therefore must be attended to in a special manner.

After all efforts to induce the child to submit quietly have failed, the Nitrous Oxide and Oxygen is allowed to commence flowing into the machine. The air valve on inhaler in this case is not opened.

The Oxygen is admitted in bountiful proportions from the beginning, and then the inhaler is placed over nose and mouth at once, and no matter whether the child inhales thru the nose, or mouth, or cries out, the gas is admitted to the lungs.

Anesthesia develops quickly and then the child is placed in a correct anesthetic position and if the Oxygen supply is noticeably too great it is gradually reduced.

If the child voluntarily submits, then the technic is practically the same as for the adult. Young children, however, as a rule breathe more freely thru their mouth after it is open, therefore, it is advisable to place the inhaler over the mouth until anesthesia is induced, at which time it may be placed over the nose. It is well also to admit Oxygen to the mixture plentifully and early, because often asphyxia develops so quickly and suddenly that symptoms are seen even before anesthesia, and are attended by violent muscular contractions of a general character.

Discernment is necessary at this stage for the reason that inexperience may misinterpret these muscular movements as voluntary; it would be a serious mistake to continue without Oxygen.

A liberal supply of Oxygen prolongs the induction period and prevents the development of the foregoing symptoms.

Mouth Breathing.

Much difficulty is encountered in certain cases either young or old, when the operative stage is reached, because the patient habitually breathes thru the mouth and returns to consciousness. This is overcome in either of three ways after the mouth cover is removed:

First: by completely closing the expiratory valve on inhaler, and, if necessary, increasing the volume and pressure of gas, thereby forcing down the soft palate, or,

Second: by manipulating the tongue with the fingers, thereby increasing the tendency to breathe thru the nose;

Third: by placing in the dorsum of the mouth a long folded and stitched gauze sponge which prevents the passage of air thru the mouth. In the later cases the respiratory valve is left open.

Vomiting and Nausea.

Vomiting, altho not occurring often, may be one of the most annoying conditions which we encounter. If vomiting actually occurs during any stage of anesthesia, and the mouth and throat is filled with solid food particles, it is wise to discontinue the anesthetic for a few moments, allowing time to remove all food debris from the air passages.

Vomiting during anesthesia is possible only when anesthesia is light. When the tendency toward vomiting is noticed anesthesia should be deepened, because light anesthesia stimulates the vomiting center.

Nausea after anesthesia is always the result either of too recently partaking of food, or as will more frequently be the case when patient is afflicted with some form of stomach trouble. In practically all cases of post-operative nausea, when Nitrous Oxide and Oxygen has been used, a history of easily induced nausea will be discovered.

Difficult Cases.

A certain percentage of what may in passing be termed difficult cases will

present in our practice. They usually require application of special technic to produce satisfactory results. A great many secondary reasons are found for these conditions. The environment of the patient, occupation and habits exert a marked influence.

It will be commonly noticed that doctors, dentists and trained nurses as a class, take anesthetics in which the nervous tension under which they live will be reflected. Locomotive engineers, chauffeurs, firemen, etc., usually after anesthetics narrate some dream of a violent nature in connection with their occupation. Men addicted to the use of great quantities of tobacco and alcoholic beverages, and patients who are addicted to the use of drugs, present the most difficult and troublesome cases which we see. The immediate reason is that the amount of N_2O taken up at ordinary atmospheric pressure is not sufficient to cause anesthesia.

Sometimes we find it advisable to employ some other than a general anesthetic in these cases, but on the other hand occasionally some condition dictates the use of a general anesthetic. The patient who has recently been the victim of some violent accident lives over in his dreams the harrowing incidents, and adds to the difficulties of the anesthetist. In practically all of these cases it will be found that the patient will tolerate but a very small percentage of Oxygen especially in the early stages of anesthesia.

Relaxation does not occur until the anesthetic has been maintained for some time.

A slight degree of cyanosis is necessary if anesthesia is to be maintained; it serves as a guide; however, the degree must not be such as to modify respiration.

RESTRAINING THE VIOLENT PATIENT.

In the administration of general anesthetics, the manner of restraint for the patient who becomes violent is a subject which should receive careful consideration.

When administering a general anesthetic to a patient we assume responsibility for his well being.

If the patient is beset by hallucinations which make him violent, we must apply restraint with the object not only of preventing him from doing violence to those present, but also to prevent him from injuring himself.

Occasionally a patient is seen who seems possessed of superhuman strength and it requires the greatest physical effort to prevent the patient from getting out of the chair.

Various methods of restraint have been suggested and tested including straps for the wrists and ankles and also straps for around the abdomen. I advise against the use of all these, not because they will not restrain the patient, but because it is possible for the patient to injure himself. A narrow strap around the abdomen might easily cause the fracturing of a rib of a patient if he exerts sufficient strain against it. And, fracture of the bones of the arms or legs might also result when narrow straps are applied. Any method of restraining by arm holts about the neck are ill advised; they are never successful and are exceedingly dangerous. It must be remembered that the patient may be partly anesthetized and may easily exert sufficient force to cause injury.

After much experimenting I have adopted a large linen band of roller towel material, eight feet in length. This band can be placed over the entire abdomen and breast. It is not necessary that the patient know it is for the purpose of restraint; after the anesthetic has progressed, the towel is knotted behind the chair. I have never known this to fail and I have never had patients complain afterwards of soreness because of its use.

The Gas Machine.

The gas machine should be carefully selected. It should be constructed in such manner that instant control is maintained at all times over both gases.

It is a wrong principle that changes the volume of gasses when a change is to be made in the supply of oxygen.

Single valve machines which do not permit of independent control of the Oxygen and Nitrous Oxide, cannot be successfully used in dental practise.

The machine should always be perfect in all its parts. There should be no leaky bags or tubes.

The inhaler should not be worn out nor softened.

Silk covered tubes should not be permitted. Very often the rubber is completely destroyed, the silk conceals this fact, and it is impossible to administer a good anesthetic under these conditions.

The Assistant.

An assistant capable of observing and thinking quickly is necessary in the adminisration of anesthetics. It is not necessary that the assistant shall be an anesthetist; she should not be required at any time to assume responsibility. Her duties should be entirely to carry out quickly and precisely instructions regarding the gas mixtures given by the dentist after he has begun operating.

She should be familiar with the working of the particular gas machine and with the inhaler;

She should understand the importance of preventing leakage of atmosphere into the mixture, or loss of the gas around the inhaler, or thru leaky tubes.

She should be instructed to the effect that no matter what the operator does she shall keep the margins of the inhaler in close adaptation to the face.

Confidence is borne of experience, and as one grows in experience he really finds that, especially for cases of short duration, there will be few contraindications.

Discussion.

James A. Jent, Pittsburgh, Kansas.

I did not know until yesterday that I was on this paper for discussion and I am not very well prepared, but I think Dr. Henahan has given us some very good ideas on this line of work. As for myself, I have been practising for the last eight or ten years with nitrous oxide and oxygen and find it to be very successful in my hands. The greatest trouble with the dental profession today is that we are afraid to use it—nitrous oxide and oxygen. I think we should all use it. Push it forward, but be very careful in the cases in which we use it. Use our own judgement and not let the patient dictate to us. I am a strong believer in conductive anesthesia. I have used conductive anesthesia to good extent. Since I began using it four years ago my practice has more than doubled itself and is still increasing. If we take Dr. Henahan's advice on nitrous oxide and oxygen there is no reason for our having any failure.

As to conductive anesthesia, we have some good men here to teach us conductive anesthesia. They are well known in their work. They can give us some good work. I think this is more important to us than nitrous oxide and oxygen. Conductive anesthesia is one of the greatest things in the dental profession today, not only in relieving the patient of pain, but relieving the doctors of strain. We can take it in the pyorrhea cases where we find the teeth so sensitive that it is almost impossible to touch them. With conductive anesthesia we can clean them up and restore the patient to health without removing the teeth.

I am not well versed on the subject and not knowing any more about it than I do, I wish to thank you.

Arthur E. Smith, Chicago, Ill.

It gives me great pleasure to enter into the discussion of a subject in which I

am so vitally interested. First of all, I wish to congratulate Dr. Henahan upon the wonderful paper which he has presented to the members of this Association. I have had the pleasure of listening and reading literature upon this subject, but never have I been more favorably impressed with a paper than that just presented. I estimate the value of this paper from the good common-sense standpoint; the essayist assumes the subject of anesthesia from a most broad standpoint, and, we must admire any man assuming this attitude. He has most ably and thoroly viewed the scientific subject of anesthesia from all its aspects, and he has not detracted in the least from any single anesthetic agent with a special mention of nerve blocking and Nitrous Oxide Oxygen anesthesia. He has quoted, as I have many times, the words of Dr. Crile of Cleveland, that no single anesthetic agent, regardless of its character, is sufficient to produce and maintain anesthesia, but that thru the careful selection of the anesthetic agent, following a most thoro physical examination, the selection of the anesthetic is made. The anesthetist, viewing this important branch of medicine and dentistry from this angle, is certain to achieve greater results and his cases of mortality will be much lower or wanting than the anesthetist who administers one anesthetic agent to all patients regardless of their psychic and physical condition.

We must admire the anesthetist who is broad enough to familiarize himself with all anesthetic agents, and one who can see the good which can be accomplished thru the medium of each of them and also realizes the value of a combination of pain relieving agents. It is not possible to secure one-hundred percent success with any single anesthetic, but when a careful selection is made among those agents which have stood the acid test of practical application, or by a combination of agents, the percentage of successful anesthesias is near the one-hundred per cent mark. It is to be regretted when any operator or anesthetist employs only one agent in his operative precedures and disregards the efficiency and value of other agents which are at our disposal today.

You would not, as dentists, make the statement that you secure success in all operations performed by you; you would not state that you employ bridge-work in all cases, nor gold inlays over the foil fillings, but after observing your patient and studying the case you then employ this or that procedure which you think is best adapted for that individual case. Some dentists today are endeavoring to employ nerve blocking in all cases or Nitrous Oxide Oxygen in all cases, and it is self evident many times their results are not as satisfactory as the dentist who is familiar with all methods of anesthesia coming under the domain of operative dentistry and oral surgery. I for one, was so unfortunate at the beginning of my professional career, to employ only one agent and I tried to make all cases conform to one anesthetic and as a result I had many failures. However, I saw my mistake and today am a strong advocate of any and all agents which have merit and have stood the acid test of practical application.

Nitrous Oxide Oxygen certainly has its place in oral surgery and operative dentistry and so does Nerve Blocking. In my opinion, the methods best adapted in the practice of oral and dental surgery are Nerve Blocking and Nitrous Oxide Oxygen and when the anesthetist is familiar with these two methods in all their phases, he certainly can render a greater service and reach a higher ideal than the anesthetist who says Nerve Blocking is the only method, or that Nitrous Oxide Oxygen is the only method.

In my work with the Study Clubs and Societies, the question has been asked me by many men which of these

methods do I prefer, and I have answered that both were necessary in order to obtain the best results. If I were to make a distinction between the two methods, I would make it as follows: Nerve Blocking the most valuable for the operative dentist, and Nitrous Oxide Oxygen most valuable for the man whose operations extend beyond those of operative dentistry. It is indeed hard to draw the line between these two important methods, and I see no reason for so doing, and I can only repeat that both methods should be thoroly mastered and then employ the method indicated.

Anesthesia is a distinct science and the evolution which it has undergone during the past few years is gratifying, and this one link is one of the strongest in the chain of medical and dental education. We should look at this wonderful advancement with pride, not only because of the fact that the relieving of pain for our fellowman is a great blessing but because most of the credit of advancement in scientific research in both general and local anesthesia goes to the dental profession of America. The goal of medicine and dentistry as practiced today is efficient results backed by thoroness accomplished thru the medium of clinical research.

The only exception I take to this wonderful paper which has been presented is the statement that nearly all dentists are employing Nerve Blocking. This has not been my findings, and I have been very careful to observe and to inquire of many men to what extent they employ Nerve Blocking. I have found that many operators are laboring under the impression they are employing the method of Nerve Blocking, and in reality they are not. Local anesthesia has a wide and extensive classification. It is divided up into many divisions and subdivisions and the mere injecting of some local anesthetic solution does not mean Nerve Blocking by any means. Nerve Blocking is defined as that method of producing anesthesia in a circumscribed area by the injecting of the anesthetizing solution in or near the nerve trunk at a distant point from the field of operation; or, it can be defined as that method of anesthesia produced following the injecting of the solution near the nerve trunk at any point between the periphery and the brain. This is truly Nerve Blocking and is only one of the great branches of local anesthesia. The dentist who states he is employing Nerve Blocking and is merely injecting the solution into the peridental membrane or gum tissue is wrong.

It is not possible to discuss the different methods of local anesthesia nor that of Nitrous Oxide Oxygen anesthesia but we must stick to the broad subject of anesthesia. The essayist spoke of methods practiced years ago, and I desire to compliment him upon the stand he has taken. The old methods were good in their day and answered their purpose for those who mastered them. We are aware of the fact it was not possible to obtain as efficient results with the older methods which were somewhat crude as compared with results obtained from the efficient methods at our disposal today for those who master them. We are living in an age of progress and the dentist of today who does not grasp the tool of efficiency and familiarize himself with those agents and methods which the sciences of medicine and chemistry offer, is not keeping abreast with progress. I think you will agree with me when I make the statement that when we view the broad field of dentistry that we have few experts who are capable of administering Nitrous Oxide and Oxygen for an indefinite period of time to the patient possessing some pathological condition. This not only holds true for prolonged cases but for the case of short duration, many times. To give a patient Nitrous Oxid Oxygen and administer it scientifically are two different things.

It is self evident that when the anesthesia is of short duration, which is generally the case in dental practice, the element of danger does not enter into the situation so gravely as when it is administered over a long period of time. Any layman with a few moments instruction could hold the anesthetic mask on the patient and produce asphyxia accompanied by cyanosis, the so-called anesthesia. There is a great difference between asphyxia and anesthesia. This layman could not administer Nitrous Oxid Oxygen for a prolonged period of time but it requires some one experienced and capable who understands the signs and symptoms of anesthesia and the dangers and the one who thoroly understands therapeutiaction of the compound Nitrous Oxid and the element Oxygen.

The above statement with reference to Nitrous Oxide Oxygen not only holds good with that method but with Nerve Blocking as well. The anesthetist who inserts the needle into the deep tissues blocking the various nerve trunks including the extraoral and intraoral methods, must thoroly understand what he is doing. He must understand the true meaning of asepsis and possess a thoro knowledge of anatomy of the parts he is injecting, the physiologic and toxic action of the agent employed must also be understood and a thoro knowledge of the technic of Nerve Blocking injection. Unless these points are mastered, I can see the hand writing on the wall. One of the most efficient methods yet presented to our profession will be discarded by many in the same way as Nitrous Oxide Oxygen has been discarded by those operators who did not thoroly understand its administration.

The time has passed when anyone can say with any degree of conscience, "Oh! anyone can administer an anesthetic". We will admit that almost anyone can pour ether or chloroform on a mask or hold the Nitrous Oxide inhaler and produce narcosis. We will also admit that anyone can cut off a leg or any one can attempt to fill a root-canal but there is a striking difference between the results of poor technic and good technic. We must remember there is something more in the practice of dentistry than merely operative procedures and we must remember there is something more besides mortality and accidents in producing anesthesia—there is the patient's mental suffering previous to the operation. The many doubts, misgivings, and the fear of our patient are often caused more by the thought of the anesthetic than of the operation. A little confidence in the man behind the mask or the man holding the hypodermic syringe adds greatly to the comfort of the patient and the maintainence of an even anesthesia if a general anesthetic is employed or the correct depth and direction of the needle, if Nerve Blocking is employed.

Gentlemen, when we stop to consider this subject of anesthesia from the patient's standpoint, it is something of grave importance. Let each one of you gentlemen place yourself in your patient's position and I doubt not that you would understand and appreciate more fully the cause of a rapid pulse, quick breathing and an anxious face. These factors plus mental anguish are manifest on the approach of the stranger who is to destroy thoughts, feelings, and strength by giving them something of which they know little or nothing about. I dare say after selecting your surgeon or your dentist for an operation requiring an anesthetic, be it one of the deep Nerve Blocking injections or the administration of a general anesthetic, your greatest concern would be who shall administer the anesthetic.

It has been my good fortune, but not my pleasure, to observe in the different hospital clinics many patients nearly drowned with ether and smothered with gas, in the hands of those who knew little about what they were doing. I

have seen ether poured on the mask until it was dripping from the patient's face, the mask being over the patient's face, the patient coughing and resisting and the anesthetist requesting them to breath easily. You and I have also observed patients rendered very cyanotic by giving Nitrous Oxide. Ninety per cent of the graduates in medicine today have had little or no actual training in the scientific administration of anesthetics and with few lectures upon this important subject. Anesthesia is a distinct science. It demands careful consideration and study. All details must be mastered. It will no doubt be of interest for you to know that there is a great need for experienced anesthetists in this great war. We cannot at the present meet this great need. The field of anesthesia, scientifically speaking, is of comprehensive magnitude, and the dentist should by no means look upon it as a mere side line of dentistry and medicine, and to those who master this subject will find that it is of immeasurable value and a source of pronounced appreciation and gratification. Science has given both medicine and dentistry countless new ideas during the past few years, but I am quite sure none of them are appreciated on the part of the patient so much as that of the relief of pain. It is wonderfully satisfying to observe the pronounced advancement in the science of anesthesia and it is especially gratifying to see the vast number of our profession taking hold of the opportunities which science offers us today. Anesthesia is of vital importance to our profession and we should recognize the importance of properly applied anesthetics and the careless administration of both general and local anesthetics should be discontinued and relegated to the rear of progressive dentistry. Carelessness in the administration of anesthetics is usually done by the practitioner having limited knowledge of physiologic and toxic effects of the agents employed.

Before closing, I wish to comment upon one statement made by the essayist with reference to what he said about instruction, and that is it is very gratifying to see the way the modern trend is going with reference to our State and Local Societies. A number of our State Organizations have seen the necessity of the Post-graduate plan meeting over the old-styled meetings. The first Post-graduate Meeting was tried out by the Oklahoma State Dental Association several years ago, and it was a great success, and numerous other State Societies have adopted this plan of meetings which have proven highly instructive. The credit of the Post-graduate plan of meetings goes to the late Dr. B. L. Shobe and to Dr. C. R. Lawrence and his able associates, of Oklahoma. Again allow me to compliment you, Dr. Henahan, upon the work which you have given here today, and I sincerely hope that it will be an inspiration for those of you who have not given this subject special study, to give it serious consideration and master it.

And remember, when service can be successfully and painlessly rendered without endangering the health of the patient, it is always advisable, and it is our duty as learned professional men, to employ those agents which have for their object the relief of pain.

F. F. Molt, Chicago, Ill.

I wish to compliment the assayist upon his paper. He presents us with a well proportioned thesis, liberal as to its attitude toward anesthetic methods, and exact in the outlined technic.

The essayist has mentioned and endorsed the use of Nerve Blocking Anesthesia as it should be endorsed, but as he says later in his paper every mode of anesthesia has its indications and contraindications. There is apparent, among a certain class of practitioners a lack of discernment which manifests itself in the tendency to overuse any new method of precedure to the exclusion of

all others—and we are possibly to see a parallel to the nitrous-oxide-oxygen analgesia fad of a few years back, which brought dollars into the coffers of the apparatus manufacturers, but comparatively little benefit to the public at large.

Witness if you will the dentist unversed in anatomy making heterogeneous injections with make-shift instruments, with solutions the constituents of which are unknown to him; and hunting for nerves, the location of which he merely guesses at. Is it any wonder that we have numerous broken long steel needles to locate away back in the pterygomandibular space or that the patients, many of them, are already condemning "conductive anesthesia?"

Let us hope that these unskilled operators may acquire the necessary knowledge or drop the precedure.

Nitrous-oxide-oxygen anesthesia fortunately has not been dragged thru the craze of faddism as has analgesia; its basis of usage is stable. *It is the safest* general anesthetic-fortunately-for *it* also is given by practitioners unskilled in its use and unskilled in diagnosis, and in cases where many times another method of anesthesia is indicated.

There are those practitioners also who adhere to the N2O anesthesia alone, depending upon their expedition to accomplish the necessary operation during the all too brief anesthetic period. Recently one of these operators remarked that in his many years of practice he had never refused this anesthetic agent to any patient. Perhaps it is because of this that "gas" and "Extraction Specialists" are so intimately associated in the minds of the Laity. However, they are beginning to defer to our judgement in the selection of an anesthetic agent since they are realizing that other methods may or should frequently be employed. They are also digesting the term "exodontist."

It frequently involves a great deal of persuasion and explanation to induce a patient already determined in his own mind to take a general anesthetic, to submit to a local, altho not frequently they are delighted to learn that local methods may be employed.

The assayist has outlined logical and sensible technic for the administration of nitrous-oxide-oxygen. He has fortunately left room for the exceptional cases; and in everyday practice these form a great proportion. The matter of technic therefore simmers down to knowing your agent and applying it in each individual case as is indicated. Neither antediluvian methods nor antediluvian apparatus should be employed. Every patient should be closely observed.

The operation really begins when the patient enters the office, for pre-operative impressions will frequently counteract well thought out technic. No matter how out of sorts the operator may be, (such a thing is reprehensible of course,) the patient should not be compelled to bear the brunt of it. Give the patient the best possible psychological foundation upon which to work; you will be amply repaid.

Do not feel that the operation is entirely over with the extraction completed, for you must see the patient safely out of the anesthetic and thoughtfully cared for. Patients have been known to be dangerously asphyxiated, by the dropping back of the tongue after the operation was completed, so do not be in a hurry to remove the mouth prop. A patient suffering from the shock of a severe operation is apt to construe mere thoughtlessness as absolute neglect, so that post-operative care is essential.

We have found that the little advice as to the patients care of the mouth is advisable and since lower molar cases, especially third molar, frequently mean some post-operative pain because of the proximity of the inferior dental nerve, just a hint as to the anatomy of the parts will mean fewer patients dissatisfied because of that pain.

The adoption of N2O-O for military

use seems the most logical thing to do. It fulfills the requirements of field hospital use where with its rapid inception of anesthesia, the patient's speedy return to consciousness, and in most cases, the absence of nausea following the anesthetic, it is ideal.

For these reasons the exodontist will never be without this anesthetic, even tho other agents come and go. Used with discrimination and intelligence favorable results will inevitably be attained.

J. P. Henahan, (Closing): I wish to thank the discussers of my paper for the kindly way in which they treated it. Upon sitting down I felt a certain amount of nervousness with regard to what was in store for me.

Thruout the paper I tried to impress my hearers with the fact that simplicity of technic is to be aimed at, and this will surely be obtained thru experience and observation.

About the only real contraindication which I have found and which might have a tendency to frighten one, is in the case of the plethoric type of man, the large, red faced fellow who, during the induction stage, is given to straining and other forms of uneasiness. Due to the violent straining there is such a rapid increase in blood pressure that the patient's color becomes very red, the eyes might even appear to project, and there would be a general condition that might warn one of the possibility of apoplexy. It is wise in these cases not to be stubborn. Anesthesia should be induced as rapidly as possible in these cases, and if this fails, some other form should be employed.

Dr. Smith referred to the thickening of the tissues under nitrous oxide anesthesia, and expressed as his opinion that it is more prevalent under this form of anesthesia than any other. To a certain extent he is correct, but only insofar as the thickening of these tissues, especially the thickening of the tongue, may always be interpreted as a symptom of partial asphyxiation due to insufficient oxygen in the mixture.

There is a difference between asphyxiation caused thru nitrous oxide and any other form of asphyxiation. In experiments carried out to determine this, it has been found that in asphyxiation resulting from the inhalation of illuminating gas, or other reasons, the general size of the brain and tissues is reduced, wherein asphyxiation resulting from nitrous oxide shows the brain to be enlarged.

The selection of the anesthetic should be made with the patient as the first consideration. Pride in oneself or his ability to use any particular form of anesthetic should not be a consideration at all. There are doctors who insist on having chloroform because of the complete relaxation which it brings, and the consequent ease with which he can operate. This relaxation is very desirable, but at the same time it must be remembered that the mortality rate with chloroform is 1 in 3000; in ether the mortality rate is 1 in 15,000, and with nitrous oxide and oxygen, properly administered to cases of ordinary risk, the rate has been placed as high as 1 in 1,000,000.

EARLY SUTURING OF WOUNDS OF THE FACE.

By V. H. Kazanjian, Major; Surgeon, Harvard Surgical Unit, B. E. F., France.

THE practice of suturing wounds of the body at an early date after injury is at present arousing an active interest among surgeons. The procedure is achieving increased success, undoubtedly because of a better knowledge of the exact nature of war injuries, of a better surgical technic involved, and of a proper use of antiseptics.

If early suturing can be accomplished, the benefits are obvious: the healing process is materially shortened, many unsightly scars are avoided, and the patient undergoes a briefer period of convalescence. There has always been a considerable divergence of opinion in regard to the most suitable time for the closure of facial wounds. Some surgeons have recommended early suturing on the grounds that undue contraction of the tissues was forestalled by bringing the lacerated borders together and that subsequent elaborate plastic operations were to a great extent evaded. Others favored late suturing at a time when the wounds were clean, asserting that suppuration and inflammation were greater hindrances than contraction of the tissues to a successful cosmetic effect. A critical analysis of the two opposing views, points to the fact that both methods must be followed to obtain a minimum amount of facial disfigurement. The determining factors are the location and severity of the wounds, the amount of involvement of adjacent structures, and the degree of sepsis that has developed.

The vascularity of the facial tissues unquestionably promotes rapid healing and an early reduction or disappearance of inflammation; yet the advantage is partly offset by these conditions:

The majority of wounds communicate with the nasal or oral cavities, from which they cannot be isolated, and they are therefore easily and persistently reinfected.

Serious injuries are always associated with a comminution of the bone tissue, the displacement of which exaggerates the size of the wound, favors the inflammation, and facilitates the spread of sepsis.

Liberal excision of the soft tissues, which is an essential feature in the technic of primary suturing of wounds in other parts of the body, is obviously impracticable on the face.

Primary Suturing.

Primary suturing of wounds of the face has been practiced frequently at casualty clearing stations, but the results, as observed at many base hospitals, would lead to the belief that the procedure is totally unsatisfactory and would continue to be so, unless modifications in technic and a careful selection of suitable cases were made. Only in mild and superficial cases has healing taken place, and when the damage to the soft tissues has been associated with bony injury, the attempted closure has ultimately given way, and brought on added inflammation, sepsis, sloughing, and discomfort to the patient.

Aside from the problem of merely

averting a deformity in cases of gunshot wounds of the face and jaws, there remains the necessity of avoiding fatal complications, of establishing drainage, and of restoring function. The treatment of the bony parts cannot at any stage be dissociated from suturing or plastic operations. The shape and expression of the human face depends on the proportional development of the bony substructures; when this framework has been mutilated, its reconstruction is the first essential step in the restoration of facial appearance. And if the bone has suffered pronounced loss, suturing or plastic operations can be performed only with artificial substitutes for this framework.

Figure 1.

Case 1.—Appearance of patient, August 27, 1917, after wound had been closed at a casualty clearing station.

Bearing in mind that sepsis, fractures and the loss of natural support are obstacles to successful primary suturing of wounds of the face, one will see that hastily conceived operations really accomplish nothing, for if the stitches fail, the progress of the patient has been retarded, while if they hold, the deformity and the suppuration are likely to be intensified.

Cases 1, 2 and 3—unfortunately representative of a large number—demonstrate the results of injudicious primary suturing in cases of extensive wounds:

Case 1.—Private H., wounded, Aug. 24, 1917, and admitted to the hospital, August 26, had been hit by pieces of metal which had destroyed a portion of the upper lip and caused wounds of the right cheek, right half of the lower lip, and the nose. The left eye also was injured. In the upper jaw the teeth and alveolar process of the right side and anterior region were destroyed, and in the lower jaw there was a comminuted fracture in the right bicuspid region, accompanied by loss of all teeth on the right side except the second molar. The wound had been completely closed at a casualty clearing station, as seen in a photograph taken on August 27 (Figure 1.) The tissues were extremely septic, and the sutures had failed, as shown in Figure 2, of September 7.

Figure 2.

Case 1.—Septic condition of tissues and failure of sutures, September 7.

Case 2.—Private L., wounded, June 22, 1917, and admitted to the hospital, June 24, had lost considerable soft tissue of the upper lip, and in addition the wound radiated to the right cheek and chin. A

large amount of alveolar process and bone, together with all teeth from the right tuberosity of the maxilla to the left cuspid, had been destroyed. In the lower jaw the comminution and loss of the teeth extended from the right angle to the left cuspid. The result of operation at a casualty clearing station is shown in Figure 3 (photograph taken June 25), and the appearance on June 26 is seen in Figure 4.

Figure 3.

Case 2.—Result of operation at a casualty clearing station, June 25, 1917.

Figure 4.

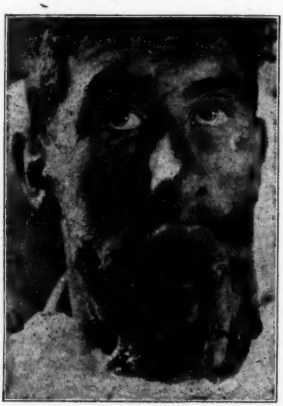
Case 2.—Appearance of patient, June 28.

Case 3.—Second Lieutenant A., wounded, September 20, 1917, and admitted to the hospital, September 22, had a lacerating wound of the lower lip, right cheek and chin which involved no appreciable loss of soft tissue. The comminution of

Figure 5.

Case 3.—Appearance of patient, September 23, 1917, after suturing of wounds at a casualty clearing station.

Figure 6.



Case 3.—Resulting condition, September 27.

the mandible extended from angle to angle with pronounced displacement of the fragments and a considerable loss of bony tissue. The wounds had been sutured at a casualty clearing station, as shown in Figure 5 (photograph taken September 23), but the resulting condition, September 27, is illustrated in Figure 6.

Certain kinds of wounds, however, appear to respond favorably to primary suturing at advanced units. Superficial wounds with no loss of soft tissue, and also those with slight or no connection with the oral or nasal cavities, in most instances may be closed successfully. The lip borders and also the nose, being delicate and weakly supported, often unite after injury in an unnatural approximation with nearby tissue, and if conditions allow their proper location by operation at an early stage, the benefit is appreciable.

While, however, steps may have been taken on the one hand to improve the appearance of the face, on the other the individual may have been harmed in other ways. The need of avoiding a general anesthetic cannot be overemphasized when the patient is suffering from gunshot wounds of the face and jaw, for the presence of sepsis in the oral cavity only too often leads to respiratory complications. From our experience, a very high percentage of deaths from bronchopneumonia have given a previous history of the administration of a general anesthetic.

If suturing is attempted, it should be invariably under a local anesthetic, not only because it evades the occurrence of complications, but also because the area affected by the injury is often so reduced in sensitiveness that anesthesia is gained by small amounts of procain in conductive or infiltrative injections.

Early Secondary Suturing.

While there does not appear to be more than a limited field for primary suturing, there is broad scope for early secondary suturing. Most cases have been done between the fifth and twelfth day after injury, depending on the nature of the wound, the condition of the patient, and the severity and duration of the infection. Fixation of the bony fragments and a control of sepsis *always* precede the operation. The types are:

(a) Wounds in which there is slight or no bony injury.

(b) Wounds involving extensive bony injury *without loss* of soft tissue.

(c) The radiating parts of certain wounds, as a definite step in preparation for a later plastic operation.

In all cases the preliminary treatment of the injuries is directed to reduce the inflammation and edema as soon as possible by fomentations and frequent dressings with eusol (a solution prepared by mixing chlorinated lime, 12.5 gm., and boric acid, 12.5 gm. with water to make 1 liter, and filtering.) The oral cavity and wounds are syringed freely and frequently with antiseptic solutions—such as potassium permanganate or boric acid—and adequate drainage is maintained. Then, when the wound appears clean, suturing is attempted, with special precaution to avoid tension by the use of sliding skin flaps or the undermining of the adjacent surfaces. It is often advisable to leave a small portion open to continue the proper drainage.

Wounds With Slight or No Bony Injury.

Case 4.—Private M., wounded, July 30, 1916, and admitted to the hospital, August 2, had a wound of the right cheek and also of the nose with some laceration (Figure 7.) No comminution from the wound to the antrum, nasal cavity or mouth had been caused, but the upper jaw as a whole was fractured without displacement or complication. August 10, the soft tissues were practically free from sepsis and were sutured. The condition of the wound on evacuation of the patient, August 20, is shown in Figure 8.

Case 5.—Private D., wounded, June 10, 1917, and admitted to the hospital, June 13, had an extensive lacerating wound of the right cheek (Figure 9.) The

superior maxilla as a whole was fractured without comminution or displacement, and there was a simple fracture of the right ascending ramus of the mandible, without complicating factors.

Figure 7.

Case 4.—Appearance of patient on admission, August 2, 1916.

Figure 8.

Case 4.—Condition on evacuation, August 20.

A small opening led to the right antrum, which, in turn, drained intra-orally at the upper right bicuspid region. The wound was closed, June 27. The right eye had been enucleated, June 15, under a general anesthetic, and it was necessary to allow slight drainage at the upper end of the wound. On evacuation, July 6, the suppuration had practically ceased. The facial appearance is shown in Figure 10.

Figure 9.

Case 5.—Appearance on admission, June 13, 1917.

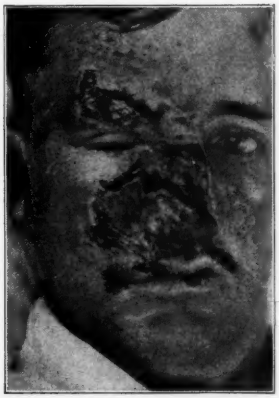
Figure 10.

Case 5.—Condition on evacuation, July 6.

Case 6—Private De., wounded, August

5, 1916, and admitted to the hospital, August 8, had superficial wounds of the right supra-orbital region, cheek, nose and upper lip (Figure 11.) There was only slight bony injury to the nose. By August 26, the wounds were clean and sutured (by Major Wheeler.) An external appliance was used immediately to maintain the position of all soft parts during the process of healing. September 10, a slight correction was made in the left ala of the nose. The patient was evacuated, September 20, as shown in Figure 12. The first photograph (Figure

Figure 11.



Case 6.—Appearance on admission, August 8, 1916; traces are visible of early suturing prior to admission, successful only at the margin of the upper lip.

11) shows traces of early suturing prior to admission, which was successful only at the margin of the upper lip. Failure may be attributed to sepsis and to excessive tension on the sutures, which in the later operation was avoided by appliances.

Wounds Involving Bony Injury.

Wounds involving bony injury vary extensively in regard to the severity and amount of destruction. They all suppurate freely, and the inflammation is marked. The early treatment is directed toward the reduction of sepsis and swelling by the use of frequent irrigation and fomentations. All irritating and *useless* fragments of bone or teeth are removed, splints for the reduction of the fracture applied, and appliances in certain instances also used to support the soft tissues.

Suturing is not attempted until the inflammation has disappeared from the parts, and then the entire wound is not always closed, since abundant suppuration takes place from within the oral cavity from the injured bone.

Figure 12.

Case 6.—Condition on evacuation, September 29.

Cases 7 to 11 illustrate this condition:

Case 7.—Private T., wounded, March 17, 1917, and admitted to the hospital, March 20, had a small wound of entrance in front of the left ear and a large wound of exit on the right cheek involving the angle of the mouth. There was no appreciable loss of soft tissue (Figure 13.) About three-fourths of the maxilla, and all the teeth and alveolar process, were destroyed, resulting in perforation of both hard and soft palate. Various mechanical supports were used to mold the palate, and April 1, the wound was sutured. The patient was supplied with oral restorations and evacuated, August 14, as shown in Figure 14.

Case 8.—Private H. T., wounded, September 20, 1917, and admitted to the hospital September 22, had a large vertical

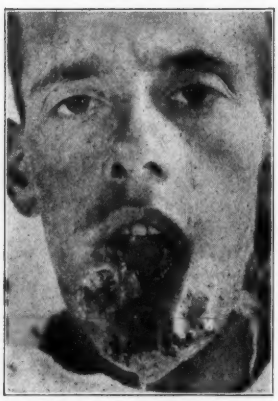
wound of the lower lip and chin (Figure 15.) In the lower jaw there was comminution with much loss of bone between

Figure 13.

Case 7.—Appearance on admission, March 20, 1917.

the bicuspid regions. A lower metal splint was adjusted October 3. The

Figure 15.



Case 8.—Appearance on admission, September 22, 1917.

wound appeared clean, October 7, and was sutured. The patient was evacuated, October 3, as seen in Figure 16.

Case 9.—Gunner C., wounded, June 27, 1917, and admitted to the hospital, June 30, had a large wound extending from

Figure 14.

Case 7.—Condition on evacuation, August 14.

the lower lip to the chin, sublingual region and neck (Figure 17,) but there

Figure 16.

Case 8. Condition on evacuation, Oct. 30.

was no appreciable loss of soft tissue. The mandible was severely comminuted from the left to the right molar regions.

The loss of mandibular continuity at the symphysis was about 1 inch. July 8, several fragments of necrotic bone were removed, and a splint was adjusted to immobilize the remaining portions of the mandible. July 15, the wounds were clean and were sutured. October 9, certain scars and folds in the submaxillary region were removed. The patient was supplied with a temporary plate and evacuated, October 14 (Figure 18.)

Figure 17.

Case 9.—Appearance on admission, June 30, 1917.

Figure 18.

Case 9.—Condition on evacuation, October 14.

Case 10.—Private B., wounded, June 10, 1917, and admitted to the hospital, June 12, had a large wound of the lower lip, right side of the chin and submaxillary region (Figure 19.) The mandible

Figure 19.

Case 10.—Appearance on admission, June 12, 1917.

Figure 20.

Case 10.—Condition on evacuation, November 19.

was severely comminuted from the median line to the right second molar. June 17, a lower metal splint was fitted. June 27, the wound was sutured. October 17 and 29, small incisions were made in the submaxillary region for drainage and abscesses. November 1, scars on the face were excised, and on November 19 the patient was evacuated (Figure 20.)

Case 11.—Private A. M., wounded, January 29, 1916, and admitted to the hospital, February 1, had been hit by a bullet which entered anterior to and

Figure 21.

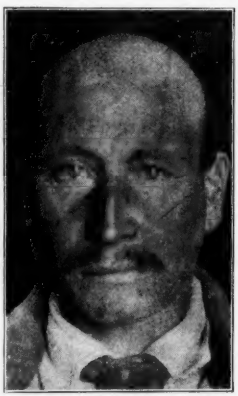
Case 11.—Appearance on admission, February 1, 1916.

above the left angle of the mandible. There was a wound of exit which lacerated the tissues of the left upper lip and cheek to the left of the nose (Figure 21.) The mandible was uninjured. The maxilla was severely lacerated and all teeth were destroyed except the right molars and the right central, lateral and cuspid. The bone carrying these three teeth was very loose. The palate was about one-half lost. February 17, the useless teeth and pieces of bone were removed. February 12, a vulcanite splint was adjusted to mold the palate vault and to immobilize the anterior segment of the maxilla. The wound was sutured on the same date. A denture was supplied and the patient was evacuated, June 6 (Figure 22.)

WOUNDS INVOLVING EXTENSIVE DESTRUCTION OF THE SOFT TISSUES.

The reconstruction of a part of the face must invariably be postponed until all suppuration has disappeared and the wound is in a healthy condition. It then demands a careful planning of flaps and appliances. The success of the final operation is augmented by the careful preliminary treatment, by the control of scar formation, by perhaps judicial early

Figure 22.



Case 11.—Condition on evacuation, June 6.

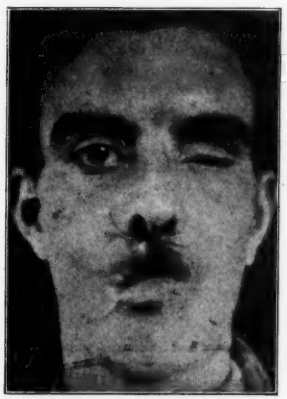
secondary suturing only of certain radiating parts, and by the maintenance of the oral cavity in a condition suitable for appliances or later oral restorations.

To illustrate examples of this type, the completed histories of Cases 1, 2 and 3 are given:

Case 1 (Continued, Figure 23.)—September 2, the mouth was cleared of the remaining useless teeth and alveolar process, and September 8 a lower metal splint was used to immobilize the mandible. September 10, the portion of the wound radiating to the right cheek was sutured, and on the following day, upper and lower vulcanite splints, designed to maintain the facial contour, were ad-

justed. December 29, the upper lip was reconstructed. February 12, 1918, dentures were inserted. January 26 and

Figure 23.



Case 1.

February 19, operations were performed to modify the shape of the mouth and

Figure 25.

Case. 2.

lips, and to remove scars. On evacuation, February 24 (Figure 24,) the lower jaw was united, and the remaining bony tissue and mucous membrane of the maxilla was in a healthy condition.

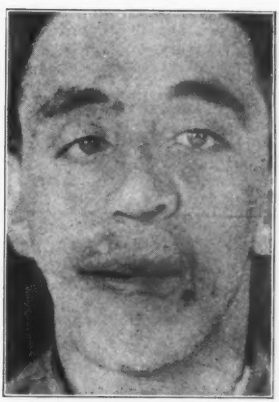
Case 2 (Continued, Figure 25.)—July

Figure 24.

Case 1.—Condition on evacuation, February 24, 1918.

7, there was a hemorrhage from the right antrum, which did not recur after packing. Vulcanite intermaxillary splints were fitted, July 12. July 14, that portion of the wound which radiated to the cheek

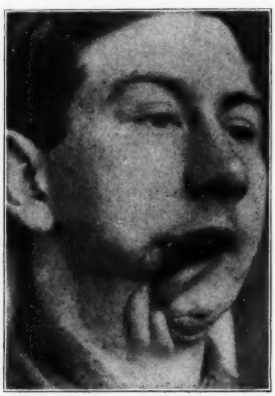
Figure 26.



Case 2.—Condition on evacuation, March 23, 1918.

was sutured. The upper lip was reconstructed, October 1. July 17 and 19, 1917, and January 25 and March 12, 1918, smaller corrective operations were performed, following the two major plastic operations. Dentures were supplied and the patient was evacuated, March 23 (Figure 26.) The lower jaw was united and the mucous surfaces of the upper jaw were in a healthy condition.

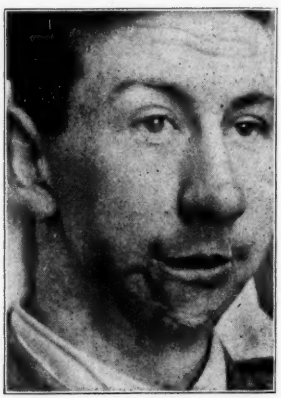
Figure 27.



Case 3.

Case 3 (Continued, Figure 27.)—October 4, 1917, a lower metal splint was fitted. November 3 and 5 and December 27, certain pieces of necrosed bone and useless teeth were removed. A vulcanite intermaxillary splint was inserted, November 21, which served to give the requisite fulness to the lower lip. Plastic operations were performed, January 15 and March 22, 1918. On evacuation April 2, 1918 (Figure 28,) there was fibrous union in the right bicuspid region and mobility in the left second molar region.

Figure 28.



Case 3.—Condition on evacuation, April 2, 1918.

All operations on the soft tissues, or for cleaning the mouth, except in Case 6, were performed under a local anesthetic.—*Journal American Medical Association.*

The Research Department
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THE RESEARCH INSTITUTE OF
THE NATIONAL DENTAL ASSOCIATION
CLEVELAND, OHIO

WESTON A. PRICE, M.S., D.D.S.,
President

A REPORT OF INVESTIGATIONS COMPLETED DURING THE PAST YEAR AND THOSE NOW IN PROGRESS AT THE UNIVERSITY OF MINNESOTA.

By Thomas B. Hartzell, D.M.D., M.D., Minneapolis, Minn.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

IT HAS been popularly supposed and currently stated that dentistry as a profession has not been capable of undertaking fundamental research. The work of the past four or five years has been intended as an answer to that criticism. The research upon which we have been engaged has been and is fundamental. Its outgrowth has led us into many fields, and instead of limiting it to the minutia of the tooth structure, we have been authorized and encouraged by our commission to follow the various lines that looked promising and encouraged further work. I have reported from time to time the work that has been done.

In order to continue lines of investigation already under way, it has been greatly to our advantage to have associated with us, Doctor W. P. Larson, Professor of bacteriology and pathology of the Medical School, University of Minnesota. As a result, the commission has enjoyed his council and material assistance. As I have said, we have had the ambition to do fundamental research and thru a series of years of observation having noticed that kidney inflammations frequently occur in patients who have mouth infection, we chose the kidney problem for investigation. Clinical observation of the type of case referred to, reveals the presence of casts and some albumen in the urine, which casts and albumen completely disappear from the urine in patients of this type after a severe pyorrhea is overcome or a group of abscessed teeth have been removed.

Research has proven conclusively that focal infection will produce casts in the urine, and I have also thought it possible that it might be responsible for Bright's disease. It was, therefore, thought desirable to institute a research directed along these lines that might possibly explain the relationship of mouth infection and kidney inflammation. In view of the fact that the kidney is frequently sterile in Bright's disease, I have been led to believe that the irritant causing injury to the kidney must be the bacterial toxin rather than the bacterium itself.

In order to test out this theory, it became necessary to secure bacterial toxins in such condition that they might be used in the attempt to cause experimental kidney inflammations. In this work, Professor Larson has joined and aided materially in the solution of our first problem,—the extraction from living bacteria of their tox albumens. We have now two different methods by which bacterial toxins can be removed from the bacteria,—a different method than the heat or chemical one. The accomplishment of this piece of research has suggested a number of other lines of research which bid fair to greatly increase our control of bacterial diseases, and also increase our ability to produce artificial immunity.

It is a well known fact that the creation of immune sera by the use of streptococcal antigen has hitherto proven a failure, due in all probability to the fact that the streptococcus is an imperfect antigen, or, possibly due to the fact that the leucocytes destroy bacteria introduced in the blood stream of an animal before they have an opportunity to stimulate a creation of the anti-bodies. Therefore, our discovery of a method to disrupt bacteria freeing their albumens may possibly enable us to produce immune sera as well as to also produce a quality of vaccine which seems to be much more potent and active in calling forth immune bodies than vaccines composed of dead organisms.

It gives me great pleasure, therefore, to introduce to you my associate and coworker, Doctor W. P. Larson, Professor of bacteriology in the Medical School, University of Minnesota, who will speak to you of some of the problems to which I have briefly mentioned. We expect to continue this work the coming year.

A REPORT OF INVESTIGATIONS COMPLETED DURING THE PAST YEAR AND THOSE NOW IN PROGRESS AT THE UNIVERSITY OF MINNESOTA.

By Prof. Winford P. Larson.

(Read before the National Dental Association at Its Twenty-second Annual Session, Chicago, Ill., August 5-9, 1918.)

DURING the past few years the dental profession has called attention to the prevalence of mouth infections such as pyorrhea, root abscesses, etc., and the relation of these focal infections to systemic disorders. This has proved a contribution of tremendous importance to the medical profession, as mouth infections were heretofore practically ignored, whereas to-day the up-to-

date physician begins the examination of his patient by an inquiry into the condition of this organ. As was quite natural the early investigations of these infections were directed toward the discovery of the infectious agent. This having been accomplished, the next logical, but more difficult, step in the working out of this problem was to discover the remedy,—which is the ultimate object of all medical research.

In our efforts to combat mouth infections we must not lose sight of the fact that infections in this locality do not differ in their effect on the general health of the individual from infections of any other part of the body. They are of more importance than infections in other localities only because of their greater prevalence. Therefore, in our efforts to combat infections of the mouth with their accompanying complications, we must attack the problem from this standpoint.

Unfortunately, all investigation so far has failed to uncover any specific remedy with which to combat bacterial infection. The animal organism alone appears to be the only mechanism able to produce specific substances capable of combating bacterial infections. It is a well known fact that an individual who has once withstood an infection by some particular microorganism often thereby acquires the property to ward off subsequent infections. This condition we speak of as an immunity. During the past ten or twelve years the trend of bacterial research has been to imitate the processes of infection by injecting killed bacteria into the organism thereby hoping to stimulate immune-body formation. In some instances this work has been crowned by partial success. In no instance, however, have we been able to attain the degree of immunity which follows active infection.

During the past year our efforts at the Minnesota Branch of the National Dental Research Association have been directed toward the solution of the problem as to why bacterial vaccines do not give the results that theoretically may be expected of them. In an attempt to get at the cause of the apparent failure of vaccine therapy as practiced today studies were undertaken to determine the fate of the injected dead bacteria. We were at once impressed by the rapidity with which bacteria were taken up by the phagocytes. Sometimes only a few minutes elapse before the bacteria have been incorporated by these cells. The bacterial cells, once ingested by phagocytes, are rapidly digested, thereby losing all their immunizing properties. Our problem therefore seemed to be clearly outlined, viz., to extract the immunizing principle from the organisms, convert it from the corpuscular to the colloidal state without depriving the bacterial proteins of their immunizing properties. Time will not permit of a detailed description of the numerous experiments made to accomplish this end and I shall therefore confine myself to a brief outline of the final results of this investigation.

We found that by subjecting bacteria to high gaseous pressure they could be filled with the gas, which, when suddenly released, would allow the gas to escape, thereby causing a disruption of the microorganisms. Our experiments proved our theory not to be without foundation, as such disrupted bacteria were actually found to be superior immunizing agents.

This work has opened up a large field of investigation. We have not only been able to attack problems immediately pertinent to the dental profession but many of general medical interest. We have found, as might have been expected, that all vaccines prepared in this way were not equally efficacious; while some thus prepared give most excellent results, others, especially streptococcic vaccines, even when completely disrupted, are apparently not perfect antigens. This is not surprising in view of the fact

that even severe streptococcic infections confer only a slight and very transient degree of immunity. Up to the present time immunological investigation has failed to offer any explanation of this variation in the properties of different bacteria to immunize. We know, for instance, that one attack of typhoid fever confers perfect immunity while, on the other hand, an attack of pneumonia and streptococcic infection only confer a very transient immunity, after which the patient seems to be more susceptible than ever to these particular infections. The fundamental mechanism operative in bringing about these diametrically opposite conditions is one that we must learn to understand before we can expect to cope successfully with these various infections.

It is apparent that such organisms as the streptococcus and the pneumococcus are only imperfect antigens, that is, they are not capable of bringing antibody formation to final termination. Taking this theory as the basis of our investigation we have sought to determine whether or not it were possible to complement our streptococcic vaccine therapy with other antigens looking to attaining a larger quantity of streptococcic antibodies in the blood stream.

During the past two or three years articles have appeared in the medical literature on the so-called foreign protein therapy. It has been found, for example, that typhoid vaccine is more beneficial in the treatment of rheumatism that is streptococcic vaccine. Upon superficial examination this would seem to overthrow all our present views regarding specific therapy. We believe that our work has thrown light on this particular point. As time will not permit me to enter into a detailed discussion, suffice it to say that we believe that the streptococcic vaccine or the streptococcic infection causes the tissue cells to produce antibodies, but that the stimulus necessary to cause the cells to throw these antibodies into the blood stream is lacking and that it is this stimulus that the foreign protein therapy supplies. This work, as worked out by *Herrmann, is now in the hands of the publisher and will soon be before the readers of The Journal of the National Dental Association. In the light of this work we feel justified in recommending that streptococcic infections be treated with streptococcic vaccines which should be terminated with a final injection of some foreign protein, as typhoid vaccine, the object of the latter being to cause the cells to throw off the streptococcic immune bodies formed as the result of the streptococcic vaccination, to be liberated.

We have not confined our investigations alone to so-called active immunization with disrupted bacteria. Investigations looking to the production of streptococcic immune serum have been undertaken along the principles just outlined. Since February a horse has been treated with disrupted streptococci. As a result a high degree of immunity has been obtained. The chief difficulty encountered in producing a bacterial immune serum is that of standardization. There is today no recognized test by which this may be done. At the present time we have under way experiments which give promises of a method permitting of this. It is hoped this will be completed in the very near future.

*Jour. Inf. Diseases, Vol. 23, No. 457.

THE SPECIFICITY OF BACTERIAL PROTEOLYTIC ENZYMES AND THEIR FORMATION.

By Harold S. Diehl, Minneapolis, Minn.

From the Department of Bacteriology and Immunology, University of Minnesota, Minneapolis.*

EVER since the recognition of enzymes as the active agents in a large number of vital processes of both multicellular and unicellular organisms, much work has been done to determine their nature and properties. Thru this we have learned much about them, but a great deal is still left unknown, mainly because it has been impossible to obtain them in a pure form. So at present we can study them only indirectly, that is, by investigating their properties and their modes of action.

One of the first properties assigned to amylases, lipases, and proteases was that of specificity. Even among the enzymes acting on the several carbohydrates a certain amount of specificity was observed; but the nature of this specificity could not be determined because it appeared that these ferments were inseparable from the bacterial cells. They are what we now know as endoenzymes of bacteria. With the proteolytic enzymes, however, more work was possible because these are given off by the cells into the surrounding medium, and are therefore susceptible of isolation.

The action of these enzymes on the proteins offered a good opportunity for the study of specificity because of the great differences between the several types of proteins. If enzymes really be specific, then one would expect that no single enzyme would be able to act on all of the widely different types of proteins. On the other hand, it hardly seems probable that a different enzyme exists for each. For, if this were actually the case, digestive enzymes such as pepsin and trypsin would have to be considered not as units, but as combinations or mixtures of many distinct ferments. Such a conception does not seem probable, nor is it borne out by the experiments of Fermi[1] and others, who came to the conclusion that the proteolytic enzymes of the digestive juices are units and are not specific for individual proteins.

Fermi,[1] in discussing this question, quotes the views of Fischer and Abderhalden. Their opinions are very similar and well worth repeating here. Emil Fischer states: "That most of our common ferments are mixed is very probable. But how far one should go in the differentiation of them is hard to say without experiment; and I must admit that most experiments which have been carried out in this connection possess but very little conclusive force. In any case I believe that it is an exaggeration to assume for each protein that is attacked by pepsin and trypsin a special enzyme; for the necessary conclusion would be that one must assume for each glucosid a special enzyme, namely, for beta-methyl-glucosid and for beta-phenyl-glucosid. According to chemical analogies, I must hold

*Researches conducted under the auspices of the University of Minnesota and the Research Institute of the National Dental Association.

[1] Centralbl. f. Bakteriol., 1, O., 1913, 68, p. 433.

this as being very improbable." Abderhalden expresses very much the same view when he says: "It is quite probable that pepsin and trypsin are not units, still, any sure proof of a gelatinase, casease, etc., is lacking in my conviction at the present time. So long as one is forced to work with unknown substrata and unknown ferments, sure conclusions are very hard to get."

In investigating this problem numerous proteins have been used to test enzyme action but gelatin has been more popular than any other. This is so chiefly because gelatin is easily prepared and any proteolytic action on it is discernible by direct observation. For this reason the digestion of gelatin has come to be looked on by many bacteriologists as an index of the proteolytic activity of bacteria, and in most cases it is quite satisfactory. Next to gelatin, casein probably has been most used, with variations of technic to determine the amount of its digestion. Hemoglobin, fibrin and other proteins have been tried with more or less satisfactory results.

Review of the Literature.

Pollak,[3] after much experimenting, was convinced, (1) that the gelatinases are not identical with trypsin and (2) that a specific gelatinase exists. He bases this latter conclusion on the fact that in immune serum he could demonstrate an antigelatinase, which would suspend the gelatinolytic activity of solutions but would leave uninfluenced the serolytic. Hattori[3] also claims to have demonstrated a specific gelatinase by the use of chemicals which would destroy the albumino-, sero- and fibrino-lytic powers of a solution, but would leave unimpaired the gelatinolytic power.

On the other hand, Declaux[4] thinks that the gelatinases and caseases are identical, and also assumes the identity of both of these with trypsin. And Fermi,[5] after extensive work with ferments obtained from animals and plants, including bacteria, concludes that the proteolytic enzymes are identical with trypsin. He found that, when fibrinases and caseases were present, gelatinases were also present; but that some bacteria which produce gelatinases do not produce fibrino- and caseino-lytic enzymes. From these findings he draws the conclusion that the same enzyme acts on all proteins, but that different proteins show various degrees of resistance.

De Waele and Vandevelde[6] also believe that the differences in bacterial proteolysis are differences of intensity only. They state that on the different nitrogenous mediums all bacteria act quite similarly and that all organisms which liquify gelatin also vigorously attack casein. To them this parallelism indicates that the liquefaction of gelatin and the solution of casein are due to one and the same ferment. However, they also find that bacteria produce various amounts of proteolytic ferments and that these ferments differ somewhat in their action; but that these differences depend not so much on the bacteria as on the conditions and environment under which the enzymes are produced.

By the use of blood agar Eijkmann[7] demonstrated an enzyme liberated by B. diphtheriae which was hemolytic but not proteolytic; and one liberated by a coccus from the air which digested gelatin but did not affect hemoglobin. To account for these differences he suggests several possibilities: (1) That different kinds of proteolytic enzymes exists, one of which will most readily act on blood and another on gelatin and (2) that some metabolic products of the bacteria other than the ferments are responsible for some of the actions. The latter possibility is one which has not been mentioned by any other workers and is decidedly the less probable of the two. He also utilized agar-elastin plates and on these observed the action of an enzyme that seemed to him identical with "the peptonizing ferment which liquefies gelatin." But, he states that there was always some incongruity in the clearing of the elastin and the liquefaction of the gelatin. This is exactly what one should expect, since gelatin and elastin tho

[3] Cited by Marras (Hofmeister's Beitr., 1905) 6, p. 95.

[3] Cited by Marras, Arch. internationale de pharmacol., 1908, 18, p. 255.

[4] Microbiologie, 2, p. 618.

[5] Centralbl. f. Bakteriol., 1913, 1, O., 68., p. 433; 1913, 69, p. 465.

[6] Centralbl. f. Bakteriol., 1, O., 1905, 39, p. 353.

[7] Centralbl. f. Bakteriol., I, 1901, 1, p. 841.

very closely related chemically are nevertheless not identical.

Mavrojannis,[8] working with 8 types of bacteria, found that 5 of these digested gelatin to the stage of gelatoses, while the other three would carry them thru to gelato-peptones. The gelatoses can be resolidified by means of formol while the gelato-peptones are unaffected by it. From these results he concluded that at least two kinds of ferments were responsible for the breaking down of gelatin, and that each of these was specific. These results, however, were soon refuted by Bogoluboff[9] and Tiraboschi;[10] but the work remains of some value because it helped to stimulate other investigations along the same lines. The latter authors found that the production of gelatoses or of gelato-peptones depends not so much on the type of ferment as on the temperature, the reaction of the medium, and the length of time which the ferments are allowed to act.

The review of the literature shows a great diversity of results and conclusions, but gives the general impression that proteolytic enzymes are probably not specific. Still such a conception leaves unexplained some of the phenomena which these enzymes often exhibit. The statement is frequently encountered that the conditions and environment greatly influence the formation and properties of bacterial enzymes. Of all the factors that are included under the conditions and environment of enzyme formation, the composition of the medium is probably the most important.

In this connection the question suggests itself as to whether enzymes are performed in the bacterial cell or whether they are produced by the organism only when the need for them arises. From our knowledge of vital processes in general, it seems more probable that the bacterial cell should be endowed with the ability to elaborate ferments, than that it should be a storehouse for the many ferments of which it has need at one time or another; or even that it should form all the ferments within its power each time that there is need for any one of them. The work of Jones[11] substantiates this view by showing that B. proteus will not form gelatinases on gelatin when any glucose is present but that as soon as the glucose has been used up the gelatinases appear. This would indicate that the ferments are not performed in the bacterial cell, but that they are elaborated in response to need. Such a concept would further suggest that the many different kinds of nitrogenous mediums would probably stimulate the production of more than one type of enzyme. For example, it does not seem probable that an amino-acid and a highly complex protein would call forth the production of identical ferments. The present investigation was undertaken to determine, if possible, the extent of the influence of mediums on ferment production.

Technic

The cultures to be studied for proteolytic enzymes were incubated at 37 C. for a period of 8 days. At the end of this time they were filtered thru a sterile Berkefeld filter and 0.5 c c of the filtrate was added to sterile gelatin and sterile casein solution. Control tubes were made in each case for comparison; and tests as to the sterility always made, all filtrates showing contamination being discarded.

The gelatin mediums used to test for proteolysis contained meat-infusion broth and 15% of gelatin. To several tubes of this in the hardened form was added a portion of each filtrate and the tubes were placed in an incubator at 20 C. Several other tubes of gelatin were liquefied before the filtrate was added and then placed in an incubator at 37 C. Liquefaction in the latter case was determined by placing the tubes in ice water until the controls hardened. The results obtained by both methods coincided in every case, altho the action was more rapid at the higher temperature.

The casein solution was made up according to the method of Füld and Gross.[12] Ten gm. of Merck casein were dissolved in 100 c c of 10% Na_2CO_3 solu-

[8] Compt. rend. Soc. de biol., 1903, 55, p. 1605.

[9] Bull. de l'Instit. Pasteur, 1907, 5, p. 429.

[10] Bull. de l'Instit. Pasteur, 1905, 3, p. 922.

[11] Jour. Infect. Dis., 1916, 19, p. 33.

[12] Cited by Marras (Centralbl. f. Bakteriol., 1, O., 1914, 74, p. 505.)

tion, enough 10% HCl added to just neutralize it and the volume made up to 500 c c with physiologic salt solution. The whole was then filtered and diluted with physiologic salt solution until the medium showed a definite clouding on the addition of acetic acid, but no heavy precipitate. This was placed in small test tubes, 5 c c to a tube, and sterilized. To test for enzymes 0.5 c c of the filtrate under examination was added to each of several tubes and incubated for 24 hours, after which undigested casein was determined by the addition of 0.2 c c of a solution of 45 parts of 90% alcohol, 5 parts of glacial acetic acid, and 50 parts of distilled water. The absence of any precipitate indicated that all the casein had been digested. With each tube of casein a control was run for comparison.

Various methods have been utilized for the detection of gelatinases in bacterial cultures. Of these, probably the most widely used is the carbolgelatin method in which 0.5 c c of the culture to be tested is added to a tube of gelatin containing 5% carbolic acid. This is supposed to prevent the growth of the bacteria but to have no influence on the action of the enzymes. Eijkmann[13] separates the enzymes from the bacteria by dialysis thru agar, but the method seems impracticable when carrying out a large number of tests. Another method widely used is the one which gave the best results in our hands, namely, the separation of the enzymes from the bacteria by the filtration of the culture thru a sterile Berkfeld filter. The method is laborious but, when properly carried out, very satisfactory.

Concerning the time at which the proteolytic activity of a culture is at its maximum, different views can be found. Von Gröer[14] states that the most gelatinases of B. prodigiosus are found in a culture 3 weeks old. Malfitano and Strada[15] found that on agar slants the proteases increase up to 24 hours and then decline. Mesernitsky[16] agrees with the work of Von Gröer on B. prodigiosus in finding that the gelatinases appear at the beginning of the 6th day and increase up to the 21st day. Bertiau[17] working with B. pyocyaneus and B. subtilis concluded that notable ferments exist in broth cultures at the end of 2 days and increase up to the 8th day, after which they decrease slowly. In our work all cultures were tested at the end of 8 days and, in case of negative results, were tested again after a greater length of time, but never did positive results appear in cultures which were negative at the 8th day.

[13] Centralbl. f. Bakteriol., 1, O., 1904, 35, p. 1.

[14] Biochem. Ztschr., 1912, 38, p. 252.

[15] Compt. rend. Soc. de biol., 1905, 59, pp. 120, 195 and 197.

[16] Biochem. Ztschr., 1910, 29, p. 104.

[17] Centralbl. f. Bakteriol., 1, O., 1914, 74, p. 374.

Experiments and Results

The content of the mediums on which the organisms were grown was varied in order to determine what effect this would have on enzyme production. Gelatin itself was first tried and proteolytic enzymes were found to be produced by each of the organisms used. These enzymes, however, were not specific gelatinases because, altho they liquefied gelatin rapidly, they also promptly digested the casein. This agrees with the findings of De Waele and Vandevelde[6] and others, and is the basis for some of the conclusions as to the identity of gelatinases and caseases.

When the bacteria were grown on the casein solution, proteases were again obtained which attacked both gelatin and casein and with the qualitative methods employed, no difference between the activity of these ferments and the ones obtained from the gelatin mediums was apparent. However, later experiments lead us to conlude that with more accurate methods for the quantitative estimation of proteolysis some differences will very probably be found. The filtrates from cultures on meat-extract and meat-infusion both likewise were found to contain ferments which would rapidly digest both gelatin and casein.

After obtaining apparently identical ferments from these several mediums, all of which contained numerous complex proteins, the other extreme was resorted to, that is, a medium was utilized which contained no organic nitrogen. It is one which Magoon[18] recommends for the cultivation of tubercle bacilli and on

[18] Washington Agricultural Experiment Station, Bull. 132.

which all of the common bacteria will usually grow well. It is made up as follows:

Ammonium phosphate, dibasic.....	1.75 gm.
Potassium phosphate, dibasic.....	0.25 gm.
Sodium phosphate, dibasic.....	0.50 gm.
Magnesium sulphate	0.50 gm.
Glycerol	20.00 cc.
Distilled water qs. ad.....1,000.00 cc.	

When all of the salts are dissolved, this is sterilized by fractional sterilization, after which it may be kept indefinitely and used as desired. Altho this medium, due to the presence of the glycerin, is not strictly inorganic it will be called an "inorganic medium" in this paper for the sake of brevity.

When inoculated into this medium, which had been placed in small flasks, 100 cc to a flask, the organisms all developed rapidly and within a few days a heavy growth was obtained. At the end of 8 days a portion from each flask was filtered and the sterile filtrate added to gelatin and to casein solution as described. But on incubation no digestion occurred in any of the tubes. Other portions of the cultures were filtered and tested at 14 and 21 days, but in no case were any enzymes obtained which would attack either the gelatin or the casein.

By means of the next experiments it was hoped to determine how close to gelatin and casein in chemical composition the mediums would have to be to stimulate the production of gelatinases and caseases. With this object in view peptone was added to the above described medium in a quantity sufficient to make a 1% solution. On this medium the organisms all grew vigorously, and it was found that they produced enzymes which would digest both gelatin and casein.

This showed the necessity for utilizing some substances still more simple as sources of organic nitrogen and, as asparagin is frequently used in nonprotein mediums, it was next tried, enough of it being added to the original medium to make a 1% solution. On this the bacteria showed rapid development and in the filtrates from the cultures enzymes were found to be present which both liquefied the gelatin and digested the casein, and with apparently equal rapidity.

These results led us to study the literature on the chemical composition of gelatin and casein by Fischer, Abderhalden and others. According to Matthews,[19] in addition to various percentages of most of the amino-acids, both of the above proteins contain aspartic acid, gelatin 0.56% and casein 1.4%. Gelatin also contains 16.5% glycocoll and casein none, while casein contains 4.5% tyrosin and 1.5% tryptophan and gelatin contains neither. Of these amino-acids tryptophan was not available, but glycocoll and tyrosin were utilized for our experiments, 1% solutions of each being made up with the "inorganic medium" as a base.

In the mediums containing glycocoll each of the 3 organisms were allowed to develop as in previous experiments but growth was found to be more slow. However, after several days a vigorous growth appeared in each of the flasks, and at the end of 8 days the cultures were filtered and portions of the filtrates tested for enzymes in the manner already described. Each one of these filtrates from the mediums containing glycocoll showed marked liquefaction of gelatin but had no action on the casein. The rate of the liquefaction of the gelatin was also marked, being noticeably more rapid than that caused by the filtrates from any of the mediums previously used, even from gelatin itself. But on the casein solution there was no action, even when allowed to remain in the incubator for several days. Other samples from these cultures were filtered and tested at various intervals up to 3 weeks, but the results obtained were always the same.

[19] Physiological Chemistry, 1916.

On the mediums containing the 1% of tyrosin growth was more rapid but the filtrates less active. In the tubes of gelatin, which were inoculated with filtrates from this medium, there was absolutely no evidence of liquefaction, either at 20 C. or at 37 C.; but in the casein solutions there was quite marked digestion by the filtrates from the cultures of each of the organisms. This digestion, altho not so rapid as that caused by trypsin, was apparently of about the same intensity as that obtained with the filtrates from broth, gelatin, peptone and asparagin.

In tabular form these results appear as follows:

TABLE 1

Results of Experiments with Various Mediums to Determine Enzyme Production.

Source of Enzymes	Liquefaction of Gelatin	Digestion of Casein
Gelatin:		
B. pyocyaneus	+	+
B. prodigiosus	+	+
B. subtilis	+	+
Broth:		
B. pyocyaneus	+	+
B. prodigiosus	+	+
B. subtilis	+	+
Agar slant:		
B. pyocyaneus	+	+
B. prodigiosus	+	+
B. subtilis	+	+
"Inorganic mediums:"		
B. pyocyaneus	0	0
B. prodigiosus	0	0
B. subtilis	0	0
1% peptone:		
B. pyocyaneus	+	+
B. prodigiosus	+	+
B. subtilis	+	+
1% asparagin:		
B. Pyocyaneus	+	+
B. prodigiosus	+	+
B. subtilis	+	+
1% glycocoll:		
B. pyocyaneus	+	0
B. prodigiosus	+	0
B. subtilis	+	0
1% tyrosin:		
B. pyocyaneus	0	+
B. prodigiosus.	0	+
B. subtilis	0	+

DISCUSSION OF RESULTS

The fact that nonspecific proteases can be obtained from cultures on gelatin, casein and nutrient broth has frequently been mentioned and is of no special significance in this paper, except to show the basis for most of the conclusions as to the identity of proteolytic enzymes. These conclusions seem perfectly logical in view of such results, and the ones reached by us would have been very similar, had not experiments with other mediums thrown further light on the subject.

The finding of no gelatinases or caseases on mediums containing no organic nitrogen at first appears contradictory to the findings of some other writers, notably Jordan,[20] Aubel and Colin,[21] and Abbott and Gildersleeve.[22] But, on close investigation of their work, one finds that the "nonprotein" mediums of which they write always contain organic nitrogen in one form or another. Jordan, for example, in his experiments varies the salt content of the mediums, but in each case asparagin is found to be present. Aubel and Colin use asparagin or ammonium aspartate as the source of nitrogen. With such findings we can well agree, but on mediums containing no organic nitrogen we are forced to conclude that enzymes are not liberated by the bacteria. These results seem significant in the study of enzyme formation and furnish further evidence that bacterial enzymes are not performed in the cell but are manufactured by the organism as the need for them arises.

The formation of both gelatinases and caseases on the mediums containing 1% of peptone is not surprising and has very little significance because peptone is a substance of rather indefinite chemical composition, which is found as an intermediate step in the breaking down

[20] Biol. studies of pupils of W. T. Sedgwick, Boston, 1906, p. 124.

[21] Compt. rend Soc. de biol., 1913, 74, p. 790.

[22] Jour. Med. Research, 1903, 10, p. 42.

of all proteins. For this reason, if it stimulated the production of any proteases at all, these would be expected to attack one protein as well as any other.

With asparagin as a source of nitrogen the production of gelatinases and caseases at first seems surprising and appears as another argument against the specificity of proteases. It is one which has been mentioned in the literature and would be a strong one were it not for the fact that asparagin is an amin of aspartic acid which is present in both gelatin and casein. Thus, proteolytic enzymes formed on mediums containing asparagin as a source of nitrogen might be expected to attack casein as well as gelatin. In regard to enzyme production in mediums containing inorganic salts plus asparagin, Jordan[20] states that the enzymes are produced in just as large amounts as they are in gelatin or in broth, but that a longer time is necessary. Our results, altho not quantitative, seem to agree with this.

As to the nature of this enzyme our work merely shows that it is proteolytic, digesting both gelatin and casein. Effront and Ehrlich,[23] however, inoculated solutions of asparagin with yeast and obtained ammoniacal nitrogen. The filtrates of such cultures also had the property of breaking down asparagin and the amount transformed was proportionate to the time. This signified to them that amidase is formed which is responsible for the action. On the other hand, Walker and Kendall,[24] after studying the proteolytic enzymes of B. proteus, conclude that the one which liquefies gelatin is in a sense at least a preparatory one, preparing the protein for assimilation and that "deaminization is an independent phenomenon, associated with the intracellular utilization of the products of proteolysis." This work makes it appear as tho there must be two enzymes formed on asparagin, but it is the proteolytic enzyme rather than the deaminizing one with which we are interested.

On glycocoll we found growth to be less vigorous than on the other mediums. This agrees with the observations of Bielecki[25] who found that bacteria will grow better on asparagin than on any of the other amino-acids which he investigated, but that some development is obtained on all. Franzen and Egger[26] also found that of asparagin, alanin, and glycocoll, asparagin forms the best source of nitrogen for B. prodigiosus, while the least growth is obtained on glycocoll. The enzymes obtained from this medium were very marked in their action, the gelatin being liquefied with surprising rapidity and the casein remaining unchanged.

On the mediums containing tyrosin the results were just as striking, the gelatin showing absolutely no liquefaction while the casein was progressively digested. The results seem quite significant in view of the fact that gelatin contains glycocoll but no tyrosin, while casein contains tyrosin but no glycocoll.

The utilization in a similar manner of other amino-acids, particularly tryptophan, would doubtless further demonstrate this point but, due to the shortage of chemicals in consequence of the present war, it has been impossible to obtain them for this piece of work. However, the ones which were used point very strongly toward the conclusion that the amino-acids play a very important part in the determination of specificity among proteolytic enzymes.

It is as yet hard to say just how comprehensive the conclusions should be which follow from such findings; but it appears that, on mediums containing no organic nitrogen, no proteolytic enzymes are formed, and that, on mediums containing but one amino-acid as a source of nitrogen, the enzymes which are

[23] Compt. rend. Acad. de sc., 1907, 146, p. 779.
[24] Jour. Infect. Dis., 1915, 17, p. 442.
[25] Compt. rend Soc. de biol., 1911, 70, p. 100.
[26] Centralbl. f. Bakteriol., 1, Ref., 1915, 63, p. 49.

formed will attack only proteins which contain that particular amino-acid. In other words, this enzyme seems specific for proteins containing that one amino-acid. Thus, the enzymes formed on most amino-acids tend to show very little specificity because the great majority of amino-acids, like aspartic acid, are present in practically all of the proteins. Also, the ferments, which are formed on mediums containing either many amino-acids or a few more complex nitrogenous compounds, would have the ability to attack large numbers of proteins, thus appearing to be entirely without specificity.

Experiments similar to the ones described in the foregoing are apparently unmentioned in the literature. Consequently the results may offer a new foundation on which to base our ideas as to the specificity of bacterial proteolytic enzymes. That these enzymes are not specific for individual proteins has been the opinion of many reliable workers and yet the conclusion that one and the same enzyme breaks down all proteins does not follow from their work. They also state a priori that it is unreasonable to assume for each protein and protein derivative a special enzyme. The results of our experiments do not contradict this. They indicate rather that the number of ferments which a bacterial cell can liberate is limited and depends on the amino-acids present.

As to whether the amino-acids in the free and in the combined state exert the same influence on enzyme production has not yet been established. The results obtained by growing the bacteria on the usual protein mediums do not lead to definite conclusions concerning this point because one cannot be certain that these proteins do not contain some free amino-acids, particularly after having been exposed to the high temperatures necessary for sterilization. Some experiments at this laboratory to determine this point are as yet unfinished, but it is hoped that they may eventually throw some light on the subject. The method employed is as follows: Sterile gelatin is subjected under sterile conditions to dialysis for a time sufficient to remove from it all crystalloid substances. Then sterile salt solution is added to give the desired salt concentration and it is inoculated with bacteria which have first been transplanted several times on the mediums containing no organic nitrogen. The object of these transplants is to obviate the possibility of carrying any amino-acids or ferments onto the gelatin along with the bacteria. As can easily be seen, the difficulties in carrying out this technic are great and as yet no satisfactory results have been obtained. However, by a technic such as this we hope to procure some further definite information as to whether pure proteins stimulate the production of enzymes. This would confirm the work of Sperry and Rettger,[27] who found that pure egg albumin, serum albumin, and edestin were unattacked by a variety of proteolytic bacteria in the absence of other organic sources of nitrogen.

But, whatever the results of this experiment may prove to be, the conclusions from those already completed will be unaffected, namely, that the amino-acids are important factors in the determination of the nature of the enzymes which are formed, and that these enzymes are probably not specific for the proteins but rather for the amino-acids which go to make them up.

In regard to the enzymes formed on complex proteins several possibilities suggest themselves: (1) that only one enzyme is formed, and that this is modified by the presence of the various amino-acids so as to attack them all, or (2) that a separate enzyme is formed to correspond to each amino-acid present, and that these different enzymes are present approximately in the same proportion as the amino-acids which stimul-

[27] Jour. Biol. Chem., 1915, 20, p. 445.

ated their formation. From our work the latter possibility seems the more probable, altho none of the results show this conclusively.

With such results as a basis, we may be able to modify somewhat our ideas of the formation and the action of bacterial proteolytic enzymes. First of all, the enzymes are dependent on some inherent property of the organisms themselves. This is evident from the fact that some bacteria do not have the ability to form certain ferments, no matter on what mediums or under what conditions they are cultivated. For example, B. typhosus and B. dysenteriae, etc., have never been known to form gelatinolytic nor caseinolytic enzymes, and, altho B. coli produces an enzyme which will form indol from peptone, it liberates none which will attack gelatin.

A second factor, or group of factors, which influences enzyme formation may be called general conditions. This includes the temperature, the reaction of the medium, the time of growth, etc., all of which have a greater or less effect on the production of enzymes by bacteria, and on which much exhaustive work has been done by such men as Kendall, Von Groer, Jordan, Abbott and Gildersleeve, Bertiau, Emmerick, Fermi, etc. Their work shows that in the formation of enzymes there is for each organism a maximum, minimum and optimum temperature, and that in most cases the optimum is about 37 C. The optimum chemical reaction is also variable, a very slightly alkaline medium seeming best for the production of most enzymes. However, as they will act nearly as well in a neutral or slightly acid medium, this point seems to be of no great importance. The quantity of enzymes present in cultures of different ages has been discussed earlier in this paper. All of these observations, altho of importance in the study of enzymes, show differences of quality only and so are not particularly pertinent to this question, for which reason they will not be discussed in greater detail.

A third and most important factor in determining the character of the enzymes produced is the composition of the medium on which they are formed. This is demonstrated by the experiments reviewed in this paper, the results of which may be put in general terms as follows: If a protein medium is inoculated with an organism which has the ability to form ferments to correspond to a large number of amino-acids, enzymes which will attack practically any protein can be obtained from the culture. This may be due to the fact that, apparently at least, ferments are formed to correspond to all of the amino-acids present, and that these ferments then attack the acids in whatever form they find them. On mediums containing less complex nitrogenous substances or only amino-acids, the same bacteria will give off ferments to correspond only to the amino-acids present, and these ferments will attack only substances containing these same acids. The vigor with which they will attack these substances seems to depend on the relative amino-acid content of the mediums on which they are formed and that on which they act, namely, if the medium on which the enzymes are formed contains only asparagin and glycocoll and the medium on which they are inoculated contains only a small percentage of one or the other, the digestive action will be much less marked than it would be if the protein medium contained more of one or both of the same acids. That is, the amino-acid content of the medium determines the specificity of the enzymes formed.

On the basis of these findings it seems that many of the so-called "irregularities of bacterial action" may be explained. Every bacteriologist finds organisms which, altho corresponding according to morphology and pathogenicity to known types, show some "irregu-

larity" in their action on culture mediums. Later, on a different lot of mediums or possibly at a different laboratory, the same organism may show the action on culture mediums which was previously expected, and the worker, at a loss for an explanation, concludes that it is merely another example of the "irregularity of bacterial action." Occasionally, there may be some truth to this conclusion, but probably very often this "irregularity" would never have appeared if the chemical composition of mediums were always the same.

These same observations of the effect of mediums on bacterial ferments will probably furnish an explanation for many of the "new strains" of bacteria which are described, but are never verified by other workers. They usually differ from well established strains only in some minor points, and slight differences in the chemical composition of the mediums on which they are grown could well account for these.

Another phenomenon for which this conception of ferment activity seems to offer an explanation is the apparent incongruity of the action of some bacteria on mediums. For example, B. proteus and B. subtilis are well known to be strongly proteolytic and exhibit typical proteolytic actions, such as the liquefaction of gelatin and the formation of indol. On the other hand, B. coli and some of the dysentery group, altho without action on gelatin, still form indol in large amounts from peptone. These organisms are not considered proteolytic and yet they unquestionably exhibit proteolytic activity when they split off tryptophane from peptone and then break down the tryptophan itself to form indol. If we accept the theory that all proteolytic enzymes are the same, we must expect these organisms which show proteolysis on peptone to liquefy gelatin. On the other hand, if we consider this in view of the findings given in this paper, the action does not appear at all surprising. Here are several organisms which have the inherent ability to form enzymes which will attack only one amino-acid and that is tryptophan. And in peptone we have a protein derivative which contains tryptophan, while gelatin is a protein in which no tryptophan is present. The explanation is self evident on this basis.

Conclusions.

On a medium containing no organic nitrogen, no proteolytic enzymes are formed by bacteria.

On gelatin, casein, broth, agar, and peptone, enzymes are formed which will digest both gelatin and casein.

The ferments obtained from mediums containing amino-acids as the only source of organic nitrogen show various actions. The ones from asparagin digest both gelatin and casein; on glycocoll, no caseases are liberated; and on tyrosin, no gelatinases.

Proteolytic enzymes are apparently formed to correspond to the different amino-acids present in the medium and will then attack these acids whether combined or free.

These enzymes are not performed in the bacterial cell but are dependent on the content of the medium on which it grows.

The specificity of proteolytic enzymes is resident in the amino-acids composing the proteins and not in the proteins themselves.

Differences in the chemical constituents of mediums may account for many of the unverified "new strains" of bacteria, the differentiation of which is based on some minor phase of their action on culture mediums.—*The Journal of Infectious Diseases, Vol. 24, No. 4, April, 1919, pp. 347-361.*

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Editorial Department.

THE ABILITY TO RELAX AND REST.

Dr. Frank Crane has an article in **Physical Culture** in which he says: "Will power is indicated not only by your ability to hang on but also by your ability to let go." How many dentists have really learned how to let go? Most of them, we imagine, do nothing but think teeth, talk teeth, handle teeth and dream teeth. An absorbing interest in one's pursuit is of course necessary in order to succeed and adequately fill one's niche in the world, but when the interest is continually concen-

trated on the one thing to the exclusion of any diverting thought the inevitable result is staleness and narrowness.

The late Oliver Wendell Holmes, one of our great American authors, is reported to have said that there were times when the very sight of a book repelled him, and a modern day editor of a leading monthly periodical has remarked that he grows literally weary of "swimming in magazines." Yet Oliver Wendell Holmes loved books, and the magazine editor is one of the world's great literary men, and takes the keenest interest in the periodical output of literature. It is merely that there comes a time when even those who are intensely absorbed in their particular pursuits grow stale in constant application and must have occasional surcease to relieve the tension of every-day occupation.

We wonder if dentists sufficiently realize this fact, or if they fully profit by it. To learn to relax properly is an art—an art well worth studying. To permit one's pursuit to dominate every waking hour to the exclusion of all things else in life is narrowing in its influence and enervating in its results. Keeping constantly keyed up demands its toll. All nature cries out against it. The trees burst forth in bloom and shake their banners to the air in intense concentration of energy during spring and summer, but in autumn they quiet down, and in winter they sleep and rest. They have learned how to relax. Plants flower and fade —and flower again and fade. Always they rest after they work, and if they did not rest well they would not work long—they would die.

Dentists should heed this call of nature. They should break away from the carking care of daily grind, and go out into the woods and fields, by the streams, and over the broad waters. They should revel in the glories of nature, and in the goodness of earth. They should expand their senses into the limitless ether of the universe, and absorb the essence of infinity.

They should lie out under the trees and abandon themselves to the wondrous æolian music played by the winds of heaven on the harp strings of the leaves and limbs. They should loll by a running brook, and watch the glint of sunshine sparkling on the tiny waves. They should hold high their hands to heaven and drink in the glory of the setting sun. They should climb mountains and sweep with eager eyes the vast expanse of valley and of slope. They should sit at night on the shore of a sequestered lake listening to the lapping of the waves on the pebbled beach, and warmed by the camp fire glowing in the edge of the near-by woods. They should sleep on a bed of boughs with the fragrance of the forest as their night's nirvana. They should rise with the summer sun, and watch the gleam of gold dispel the ghosts of morning mist. They should place themselves in harmony with the great

expanse of nature, the beneficent mother of us all; and should forget for once in the twelve-months that they had ever filled a tooth, or tried to trace a tortuous pulp canal.

The dentist who takes a vacation such as this will come back to his office renewed in body and refreshed in mind, and will for the rest of the year render better service and get more happiness out of his work. It is well, it is even necessary, that a practitioner should apply himself diligently to the science and art of his calling; it is just as well and just as necessary that he acquires the ability to relax, to rest, and to recreate.

COLLECTIONS, A PUBLIC SERVICE.

One hundred per cent collections mean one hundred per cent citizenship.

No dentist who is struggling along with 50 or 60 per cent collections is doing his full duty by the community.

If John Jones owes Dr. Smith, his dentist, a year-old unpaid bill for services rendered, John Jones is not the good citizen that he should be. Dr. Smith owes it to his community, to its prosperity and progress to collect that bill from John Jones and put Jones back on the road to the best and highest type of citizenship. Unless Dr. Smith does everything in his power to accomplish this result, he is not doing his duty by himself or by his community.

For a community is a good community only in so far as its individual citizens are good citizens. Now every citizen owes a duty to his community. That duty is in direct proportion to the standing and influence of the individual in the community. The duty of the mayor or member of the town commission is higher than the duty of the street-cleaner. The duty of the professional man and the merchant is a higher duty than that of the artisan and the clerk.

The professional men of a community, among them the dentist, owe a peculiar duty to the community. They are men who have been trained in broader, as well as more intensive things. They are men who look upon life from the vantage ground of greater educational advantages. They are looked to by the rest of the community to handle the extraordinary things of life, the things that are beyond the capabilities of the average man. Their standing and influence as a class is probably higher, in the public mind, than that of any other group in the community. Upon them rests a series of civic responsibility. The dentist who shirks these responsibilities is not living up to his life's duties.

Now a community is rated among communities in regard to its prosperity. If your community calls in a community expert and asks him to determine just what is the matter with your people and your civic interests, the first thing he will want to know is, "Do your people pay their bills?" He won't put it just that way. But his first care will be to visit your banks, and your retail merchants. If your banks are struggling along, with high interest rates, loans that are often renewed and principal that frequently is lost, if your retail merchants are carrying the burden of a long line of extended credits, and unpaid running accounts, your community expert will tell you promptly what is the matter with your community. It is living from hand to mouth, and probably is living in excess of its income.

Living outside of income is just as dangerous for a community as it is for a business concern. If a community is living in this fashion it means that the bulk of its citizens are living outside of their incomes, are living from hand to mouth, from day to day.

What is the remedy? There is but one, and that is thrift. Individual thrift means community thrift, and community thrift means community prosperity. Community prosperity means that it is easier for every individual in the community to be prosperous. It is axiomatic that, "the man who saves is the man who pays." If your community is thrifty, it will pay promptly. If your community pays promptly you will find that interest rates and prices generally in the community will go down. The community will eliminate the high prices incident to bad accounts and bad collections. The costs of thriftlessness in a community are tremendous. They appear in every purchase that every citizen makes. They increase the cost of living along every line. Thrift begets saving in more ways than one. The community which pays its bills promptly discovers that it does not have to pay so much.

Furthermore the thrifty community, the saving community, which spends not from day to day, but with a view to the multitude of tomorrows that are on the way is a self respecting community. It is a community of independent self-reliant citizens who look the whole world in the face, owing no man. This is the ideal community, and the duty of every professional man to his community demands that he do his part toward realizing that ideal.

Now what has this to do with Dr. Smith and the dentist's bill that he has failed to collect from John Jones?

In the first place by not collecting the bill, Dr. Smith has allowed John Jones to join the class of debtors in the community. By this much the whole level of community prosperity and self-respect has been brought down.

In the second place Dr. Smith has either lost, or collected from some other patients, the money owed by John Jones, and has thus taxed the thrifty part of the community for the benefit of the thriftless. In this far he is discouraging thrift.

What is the remedy? It is not to be found in any of the established forms of collection. Most of them have failed to collect the accounts in a class with the Jones' accounts, and even if they collect it they do not cure the evil, which lies primarily in the lack of funds immediately available for such extraordinary expenditures as dentist's bills, among all of those folks in the community who are in John Jones' class.

The remedy is plain. The dentist with every other professional and business man of the community should discharge his civic duty toward the community by preaching, in season and out of season the gospel of thrift. The patient with a savings bank account, or with a regular periodical investment in War Savings Stamps or some similar security always pays. He has funds available in some form or other to pay those extraordinary expenditures which are beyond the power of the man who lives from pay-day to pay-day.

Remember that the "man who saves is the man who pays" and get into the Thrift movement in your community.

Thus you will discharge your duty toward the community by aiding it on the road to prosperity and self-respect.

Thus you will discharge your duty to yourself by making your community a community where one hundred per cent collections are the rule, not the exception.

DENTAL ETHICS AND THRIFT.

Wherever dentists gather the question of dental ethics is a matter for discussion, and ofttimes for dispute. Every activity of every dentist who is true to his profession must be tried on the touch-stone of professional ethics. Whether it is Dr. DePuyster, with a magnificent suite of offices on Riverside Drive, or Dr. John Smith, who toils over the teeth of the furnace men of Steelville, his every relation to life, thru his profession or otherwise must conform to the high standard of conduct prescribed by a code of ethics based upon rigorous honesty, and a high concept of the dentist's duties to his fellow men.

Like Caesar's wife, the dentist must be above suspicion. In his professional life he must maintain a 100 per cent observance of this rigid code of ethics.

Now this means that every dentist, Dr. DePuyster as well as plain Dr. John Smith is placed within severe limits in all of his activities. It means that he must approach every act of his professional life with the question in mind "Is it ethical?" and if there is in his mind the slightest doubt that the answer to the question is yes, he must refrain from that act. This condition places on each man in the profession the entire responsibility for his own actions. And it leads to many debatable situations. The conditions surrounding no two dentists are identical. Each is confronted by different circumstances. Each has his own problems to meet or overcome. Each has a point of view on these questions of ethics which is essentially different from the point of view of all the others. But all of their conclusions must be the same—must be ethical.

As a result of this condition the usual dentist leans over backward in his observance of dental ethics as he interprets them. He is determined that he shall be above suspicion, and as a result he becomes suspicious of himself, suspicious of his own decisions, and unconsciously tightens around himself the ethical bands which already surround him. Consequently he is constantly limited in his activities to a narrower and narrower sphere.

These limitations impress themselves most onerously in two important directions which are vital to the successful career of the dentist.

The first is his relation with his community.

The second is his relation with his own patients.

Thru the first limitation he finds himself hampered and cramped in his efforts to become acquainted with his community, and to make his community become acquainted with him. He cannot use the ordinary business means of drawing his community's attention to himself, his personality, and the quality of his service. That is not ethical. He must find other means. But the other means are hard to find, and with the touch-stone of ethics always waiting to test the availability of such means he may not be able to decide on means satisfactory to his sense of responsibility to his profession.

Thru the second limitation the dentist finds himself hampered in his collections. There may be grave ethical questions in his mind as to the use of the ordinary business methods of collections. He may be struggling along with 40 per cent or 50 per cent of his bills uncollected. The difference between this condition and 100 per cent collections means success or failure for him. Without those collections the question of how he shall make up the deficit, whether he shall stand the loss himself, or increase his prices to his paying patients may assume to him the appearance of an ethical question. In economics, of course, it is wrong for him to either carry

the loss himself or to unload it on his paying patients. Those collections must be made 100 per cent.

How can he overcome both of these limitations on his activity, without doing violence to his ethical sense? There is one means at his disposal which is of the highest standing in ethics, which is not even debatable and which whether he be Dr. De Puyster or plain Dr. John Smith, will get results.

He can become a Thrift booster.

It doesn't sound sensational, but let us see what it means.

He can join with his local Savings Director to spread the gospel of thrift in his community. By so doing he at once establishes a medium thru which he can become acquainted with his community, become a part of its daily life, become a familiar figure in its daily happenings, and make every citizen in the community acquainted with him. "Dr. Smith, the prominent dentist," becomes identified with a civic movement, a great nation-wide campaign which has the support of every thinking citizen. The people of his community immediately want to know about him, professionally as well as otherwise, and he is on the road to a wide acquaintance. There can be no question of ethics here. Dr. Smith is performing in the highest possible manner his duty to the community. He is helping to lift the whole moral and financial level of his community. The strictest interpreter of ethics could not object. And at the same time he is making himself known.

Now how does Dr. Smith's participation in the thrift movement help him in his collections? Just this way. The man who saves is the man who pays. Undoubtedly the bulk of Dr. Smith's uncollected bills are against individuals who live from day to day, from hand to mouth. They do not pay their dentist bills because they have no ready funds available. Their money goes to the ordinary day by day expenditures, and Dr. Smith's bill is an extraordinary expenditure. If each of Dr. Smith's delinquents was to start today putting away a fixed, regular periodical amount in the War Savings Stamps issued in connection with the Thrift movement, or in a savings bank account, each of those delinquents would be on the road toward paying Dr. Smith's bill. When a man owes a bill and has the money to pay it, his natural inclination is to take the money and pay the bill.

It is apparent therefore that whatever Dr. Smith can do to increase thrift in his community is helping just that much toward bringing his collections up to the 100 per cent mark.

RECENT PATENTS RELATING TO DENTISTRY.

1299102, Orthodontic implement, Edward H. Angle, Pasadena, Cal.
1299103, Orthodontic implement, Edward H. Angle, Pasadena, Cal.
1299137, Dental tool, Charles H. Davis, deceased, Worcester, Mass., B. B. Davis, executrix.
1298673, Dental plate, Carlo De Felice, New York, N. Y.
1299364, Fastening for removable dental bridges and bridge-plates, Charles W. Lokey, Birmingham, Ala.
1299067, Dental bridge-work, Chester J. Underwood, Elgin, Ill.
1299535, Oxyacetylene blow-pipe, Oscar T. Anderson, Waterloo, Iowa.
1299441, Waste-fitting for fountain cuspidors, Edward Ennis, North Cambridge, Mass.
1299530, Blow-pipe, George H. Zouck, Orange, N. J.
1300937, Tooth-brush, Wm. S. Edwards, Long Beach, Cal.
1300868, Dental cuspidor fixture, C. H. and A. F. Piper, Rochester, N. Y.
1300495, Dental tool, Joseph H. Shank, Blanchester, Ohio.
1301181, Artificial tooth attachment, Wm. F. Shaw, Pueblo, Colo.
1301817, Dental articulator, Dayton D. Campbell, Kansas City, Mo
1302152, Artificial tooth, George Goldfoot, Cork, Ireland.
53254, Design, Napkin and toothpick holder, Charles M. Sanders, Guthrie, Okla.

Copies of above patents may be obtained for fifteen cents each, by addressing John A. Saul, Solicitor of patents, Fendall Building, Washington, D. C.

Army and Navy

FOR THE STRANGER IN A STRANGE LAND.

(A brief history of how an American dentist, "Daddy" Ford, of Toulouse, turns his office over to Yanks and how loyally and unselfishly he is caring for the graves of five American soldiers.)**

During these days of post-hostilities reconstruction many are the stories of the deeds wrought by American soldiers during combat, of the sacrifices made by members of the associated non-combatant organizations. Most of these accounts are of some heroic efforts, some supreme sacrifices, which have been incident to many a battle activity. These deeds should receive the unalloyed praise of every American citizen, and the memory of their meaning should never be allowed to dim. But, once in a long while, perhaps these incidents could be counted upon the fingers of one hand, there comes from one source or another a different kind of heroism, no less creditable than the other, because its praises have not been sounded before a hero worshipping nation. This particular case is one of quiet sacrifice, of unselfish devotion, of hard unremitting toil. And because the man who has done this is an American, because he was and is still by profession a dentist, the writer considers that his professional brothers in American lands should know of him, and should praise him for the work that he has accomplished.

DR. GEORGE FORD.

This is not a story of front line sacrifice: therefore its history will probably never adorn the front page of an American news paper, but if those who read this article care to search for its cause

**A personal friend of Dr. George Ford has sent us the following description of the wonderful work that Dr. Ford has done for the American soldiers at Toulouse. He is an excellent example of an untiring and unselfish, patriotic and loyal American. His present address is as follows: Dr. George Ford, 21 Rue Alsace Lorraine, Toulouse.—Editor.

let them search in the archieves of the newspaper of the American Expeditionary Forces, The Stars and Stripes, for April 4th, 1919, in an article headed "Coffee, Bread, Jam in Dental Parlors."

There is a city in France called Toulouse, and it lies by the banks of the River Garonne, in an out of the way corner of Base Section No. 2, of the A. E. F. The neighboring region is known, according to this article, as the only place in France where it is sunny: the writer, having been in almost every other locality in France, is quite willing to accept the statement at its face value by a process of natural elimination. In Toulouse, since 1872, there has been an American dentist, and his name is Dr. George Ford. He is getting along in years, and the ready tongue of the Americans with whom he has associated has resulted in the nick-name "Daddy Ford." He has been practicing dentistry in Toulouse for many a long year, and tho old, he is still using what spare time he has from his present duties in continuing at his chosen profession.

It is of his "present duties" that we are to speak. Toulouse has been familiar with the appearance of the American uniform for many months; it is quite possible that the French inhabitants of this city were aware of the presence of Americans long before the helping organizations of the Army were able to provide means for their comfort and entertainment: it is absolutely certain that "Daddy" Ford knew of it, and it is just as certain that the good Doctor did not sit back in his chair and aimlessly wonder why provisions were not made to keep the boys happy and out of trouble. He turned his dental office into a rest room for American soldiers, and his housekeeper, an elderly Frenchwoman, prepared hot drinks and sandwiches. In course of time he received material aid from the Red Cross but the original initiative was his, and the credit for the good accomplished belongs to him. Americans at home do not know of his unselfish efforts: many Americans in France have never heard his name: and it will be thru no action of his if his generous sacrifices become buried in obscurity. He has done his work, he is still going ahead, doing the best he can, and he considers it no more than his duty to help. It may be his duty, but he has more than discharged his obligations. In addition he has given his professional services and supplied materials without charge to the officers and men needing dental service.

"Daddy" Ford has done more than operate a lunch parlor for our soldiers. Before Americans arrived in Toulouse in any considerable numbers, there were numerous casuals who dropped off there while en route to other points in France. Some of these boys were ill, and a few died. Read what the Stars and Stripes has to say of a portion of his activities:—

"In time the Americans in Toulouse came to number many thousands. There were hospitals and supply depots and labor companies, and Daddy Ford went on with his transfiguration. There was one day when one of the first boys to come to Toulouse died in the hospital. That same day "Daddy" Ford arranged for a cemetery about two miles outside Toulouse. Today there are five little graves on the level plain, five white crosses upstanding in a row, above every cross an American flag. The flags and palms that "Daddy" Ford has planted are almost always straightening in the winds that sweep the plains but they never disappear. Every morning the old man goes out to rearrange the flowers and to see that the little hillocks are in good condition."

If there is one thing above all else that a mother wishes for a dead son, it is that his resting place shall be marked, and that he shall lie in surroundings pleasant to remember, and where some distinguishing mark shall point him out as an American and as a soldier. Had

Dr. Ford's efforts stopped at this small attempt to mark the American soldier as his own brother, he would have done far more than his duty, and he would have merited the commendation of every American citizen at home. For, even under the more congenial surroundings, service by a stranger in a strange land is always fraught with worries, with loneliness and with temptations. Nothing means more to the American Soldier, nothing leaves a clearer impress upon his character than the continued, intimate association with a mature American, for whose efforts can always be said "He has done the best in his power: and he helped."

Ask the Americans in Toulouse if "Daddy" Ford helped them. Ask those Americans who have only heard of his work, if they have been inspired by his example. His work has been to the "Stranger in a strange land", and this is a small tribute to his work by an Army dental officer who is proud that Dr. Ford is a member of the dental profession.

ARMY MEDICAL EXHIBIT.

An exhibit of the Army medical department at the convention of American Medical Association at Atlantic City, N. J., this week was prepared under authority of the Secretary of War and the surgeon general by Col. C. F. Craig, M. C., curator, Army Medical Museum.

The object of this exhibition was to show the activities of the medical department during the war, illustrating developments attained in medicine, surgery and sanitation. The main features are disease control, sanitation, hospitalization, medicine, surgery and reconstruction.—*Army and Navy Register, June 14.*

THE SEVENTH FIG.

In the market place of the ancient and picturesque town of Saintes an old woman was counting out for me the six ripe figs which, according to her sign, she was to sell for 50 centimes (10 cents). She picked out the best in her basket and then added a seventh. I called her attention to the fact that she was giving seven instead of six. Her wrinkled face brightened as she looked up to me and said: "Ah, c'est pour la Croix Rouge Americaine" (Ah, that is for the American Red Cross). The people over here are wonderfully appreciative, but nothing has ever expressed that appreciation to me so eloquently as that seventh fig.

DENTAL CORPS ORDERS FROM WAR DEPARTMENT.

DENTAL CORPS.

Maj. Aaron F. Eidemiller and Capt, Edward A. Thorne to Panama Canal Department for duty.

Capt. Luther C. Whitlock to port of embarkation, Hoboken, N. J., for duty.

—*Army and Navy Register, May 24.*

Capt. Edward M. Atkinson to Fort Leavenworth, Kans., for duty.

—*Army and Navy Register, May 31.*

Lieut. Col. Raymond E. Ingalls to Philippine Department for duty as department dental surgeon.

Maj. Oscar G. Skeleton to France for duty.

Capt. Harold H. Buehler to Hoboken, N. J., port of embarkation, for duty.

Capt. Cline S. Beurmann to Fort Des. Moines, Iowa, general hospital 26, for duty.

Capt. Byron S. Behney to general hospital 31, Carlisle, Pa., for duty.

Capt. Wm. F. Blair to San Francisco, Letterman General Hospital, for duty.

—*Army and Navy Register, June 7.*

Lieut. Col. Rea P. McGee and Capt. Edmund J. Kelly to Jefferson Barracks, Mo., for duty.

Maj. Crittenden Van Wyck to Fort McPherson, Ga. General Hospital 6, for duty.

Capt. Eugene F. Rockafeller to Americus, Ga., Southern Field,, for duty.

Capt. Richard F. Thompson to France for duty.

Capt. Leroy T. Asche to Hoboken, N. J., port of embarkation, for duty.

Capt. Clayton A. Patterson to Fort Leavenworth, Kan., for duty.

Capt. John L. Remsen to Walter Reed General Hospital, D. C., for duty.

—*Army and Navy Register, June 14.*

NATIONAL SOCIETIES, 1919.

October.

20-24—New Orleans, National Dental Association.

20-24—New Orleans, National Association of Dental Faculties.

18-20—New Orleans, National Association of Dental Examiners.

20—New Orleans, Delta Sigma Delta.

20-24—New Orleans, Xi Psi Phi Fraternity.

20-24—New Orleans, Association of Military Dental Surgeons.

17-18—New Orleans, International Society of Prosthetists.

20-24—New Orleans, Psi Omega Fraternity. Grand Chapter meeting and National Alumni Chapter meeting.

STATE SOCIETIES.

July.

8-9-10—Wisconsin, Milwaukee.

14-15-16-17—Washington, Seattle.

16-17-18—New Jersey, Atlantic City.

21-26—Montana, Butte.

August.

25-30—Virginia, Richmond.

September.

4-5-6—Tennessee, Nashville.

October.

21—Louisiana, New Orleans.

Rhode Island, Providence.

December.

2-3-4—Ohio.

DATES TO BE ANNOUNCED.

Arizona, Phoenix.

POST-GRADUATE COURSE OF VIRGINIA STATE DENTAL ASSOCIATION.

The Virginia State Dental Association will give a post-graduate course, August 25-30, 1919, Richmond, Va. This will be the fiftieth annual session of this great society. The subjects and lectures are as follows:

Course in Crown and Bridge-work.
By Forrest H. Orton.....Minneapolis, Minn.

Course in Nerve Blocking Anesthesia and Oral Surgery.
By Theodor Blum.....New York City.

Course of Lectures on Dental Roentgenology.
By A. L. Gray.....Richmond, Va.

W. H. Street, Cor. Secy.,
Richmond, Virginia.

SEND MARCH, 1919, JOURNAL TO THE NATIONAL OFFICE.

The National Dental Association needs about 300 copies of the March, 1919, Journal to supply libraries and members of the profession who expect to bind Vol. No. VI. If you do not expect to preserve your files, kindly mail this number to the National office.—Dr. Otto U. King, 127 No. Dearborn St., 1017 Unity Bldg., Chicago, Ill.

SPECIAL ANNOUNCEMENT TO THE DENTISTS OF MAINE.

The seventy-ninth Legislation of Maine passed several very important amendments to the dental laws.

The dentists of Maine should take special notice of the fact that beginning January 1, 1920, all dentists must register annually with the Board of Dental Examiners, and unless they comply with this provision of the law, they can not legally practice dentistry in the state of Maine. It is understood that later the Board of Dental Examiners of Maine will give due notice of this feature of the law, with application blanks for registration, to all dentists known by them to be legally entitled to register. The secretary of the Board of Dental Examiners is Will S. Payson, Castine, Maine.

VIRGINIA STATE DENTAL ASSOCIATION.

The next meeting of the Virginia State Dental Association will be held at Richmond the week of August 25th to 30th inclusive.

HARRY BEAR, Asst. Secy.,
410 Professional Bldg., Richmond Va.

PRELIMINARY ANNOUNCEMENT OF THE 1919 PROGRAM OF THE NATIONAL DENTAL ASSOCIATION.

New Orleans, La., October 20-24, 1919.

PROGRAM OF THE SECTION ON ORTHODONTIA AND PERIODONTIA.

New Orleans, La., October 20-24, 1919.

Officers.

J. Herbert Hood.....Chairman
1101 Guardian Bldg., Cleveland, O.

Harry E. Kelsey.....Vice-Chairman
833 Park Ave., Baltimore, Md.

J. Oppie McCall.....Secretary
437 Franklin, Buffalo, N. Y.

Tuesday Afternoon, 2:00 P. M.

"An Analysis of the Various Principles of Orthodontic Treatment that have been Advocated during the Last Fifteen Years."
By J. A. Cameron Hoggan.....Richmond, Va.

"Necessity for Oral Prophylaxis and Radiology in the Practice of Orthodontia."
By F. M. Casto.....Cleveland, Ohio

"Observations upon the More Recent Developments in Periodontology."
By Arthur H. Merritt.....New York, N. Y.

"Why the Field of Prophylaxis is Marked with a Lack of Enthusiasm."
By Dorothea A. Howes.....Washington, D. C.

Wednesday Morning, 9:00 A. M.

"Plurality in Etiology of Periodontoclasia."
By John O. McCall.....Buffalo, N. Y.

"What to Extract, and What Not to Extract, with Reference to Infections Involving the Periodontal Membrane."
By Louis D. Corrieli.....Baltimore, Md.

"An Analysis of Case Characteristics with Reference to the Selection of the Most Efficient Form of Appliance for Treatment."
By A. H. Ketcham.....Denver, Colo.

"The Problem of Retention."
By C. A. Hawley.....Washington, D. C.

PROGRAM OF THE SECTION ON OPERATIVE DENTISTRY, MATERIA MEDICA AND THERAPEUTICS.

New Orleans, La., October 20-24, 1919.

Officers.

J. F. Biddle.....Chairman
517 Arch St., Pittsburgh, Pa.

H. Herbert Johnson.....Vice-Chairman
Commercial Bank Bldg., Macon, Ga.

Harold S. Smith.....Secretary
1010 Belmont Ave., Chicago, Ill.

FIRST SESSION.

"The Prevention of Chronic Mouth Infection."

(Illustrated with stereopticon slides.)

By Arthur D. Black.....Chicago, Ill.

Abst.—This paper will consider briefly the pathological changes which occur in cases of chronic alveolar abscess and chronic pericementitis, and will then discuss the causes and take up in detail the methods to be employed in operative dentistry for their prevention. Extensive studies of radiographs of root fillings will be reported, and means of simplifying pulp treatment and root-canal technic will be presented. Particular stress will be laid upon improvements in operative procedures to prevent peridental infection.

Discussed by
H. E. Friesell.....Pittsburgh, Pa.
A. H. Hipple.....Omaha, Neb.

"X-Ray in Dental Practice."
By C. Edmund Kells.....
.....New Orleans, La.

Discussed by
H. B. Tileston.....Louisville, Ky.
Howard R. Raper, Albuquerque, N.M.

SECOND SESSION.

"Some Recommendations for the Sterilization and Filling of Infected Roots."
By Weston A. Price.....Cleveland, O.

Discussed by
Clarence J. Grieves.....Baltimore, Md.
Percy R. Howe.....Boston, Mass.

"The Gold Inlay."
By R. H. Volland.....Iowa City, Iowa.

Discussed by
Wallace Wood.....New Orleans, La.
W. L. Fickes.....Pittsburgh, Pa.

PROGRAM OF THE SECTION ON HISTOLOGY, PHYSIOLOGY, PATHOLOGY, BACTERIOLOGY AND CHEMISTRY—RESEARCH.

New Orleans, La., October 20-24, 1919.

Weston A. Price.....Chairman
8803 Euclid Ave., Cleveland, Ohio.

Frank O. Hetrick.....Vice-Chairman
324 Main St., Ottawa, Kansas.

Harris R. C. Wilson.....Secretary
701 Schofield Bldg., Cleveland, O.

FIRST SESSION.

"How Mouth Infection Affects the Kidneys."
By Thomas B. Hartzell.....
.....Minneapolis, Minn.

"A Phase of Dental Caries."
By Percy R. Howe.....Boston, Mass.

"A Biochemical Study of Bacterial Metabolism in Its Relation to the Denser Tooth Structures."
By Samuel E. Pond....Cleveland, Ohio.

SECOND SESSION.

"A Dental Histo-Pathological Study."
By Harold Box.....Toronto, Canada.

"Physiology and Pathology of Special Interest to Dentists."
By J. J. Sarrazin....New Orleans, La.

"Studies of the Variations in Susceptibility to the (so-called) Rheumatic Group Lesions and to the Influence of Oral Focal Infections."
By Weston A. Price, Cleveland, Ohio.

PROGRAM OF THE SECTION ON PROSTHETIC DENTISTRY AND CROWN AND BRIDGE WORK.

New Orleans, La., October 20-24, 1919.

Officers.

William A. Giffen.....Chairman
609-610 Washington Arcade, Detroit, Michigan.

Julius F. Hovestadt.....Vice-Chairman
200 Marlboro, Boston, Mass.

K. G. Knoche.....Secretary
25 E. Washington St., Chicago, Ill.

Special Announcement.

Owing to the fact that only two half day sessions can be given to this Section, it has been deemed best to dispense with long exhaustive general papers and discussions, as more definite information can be given by selecting men to cover as many of the vital phases of this branch of dentistry as possible, with a view to standardizing technical procedure. The audience will thus individually have the opportunity of either accepting or rejecting the teachings of the essayists.

In addition to the papers and illustrations, the essayists will give individual clinics in order that those who desire to meet and discuss details further with the clinicians may have this opportunity.

FIRST SESSION.

Prosthodontia.

"Scientific Interpretation of Muscular Control of Mandibular Movements."

By George H. Wilson....Cleveland, O.

Syn.—The dental profession and anatomists generally are not clear on this subject. Dr. Wilson has been doing research work along this line for some years, and is now ready to present his findings to the profession. Owing to the importance of this subject in its relation to denture construction we are fortunate to have it presented to us by a man of Dr. Wilson's ability and experience.

"Surgical Interference for Preparation of Malformed Edentulous Mouths for Construction of Dentures.

By James P. Ruyl.....New York City.

Syn.—Demonstrates technic, using motion pictures for removing protruding gum tissue, irregular alveolar process, and other deformities in order to simplify complicated cases by providing a firm foundation upon which to build artificial dentures that will be more efficient and more beautiful.

Crown and Bridge Technic.

"Construction of Cast Clasps for Partial Dentures and General Consideration of Other Methods of Retention and Attachment of Vital Teeth for Removable Bridge-work."

By Louis J. Weinstein.....
.....New York City.

Syn.—Mr. Weinstein's knowledge of the uses and abuses of metals used in dentistry, combined with his technical experience enables him to present us with definite information on a subject of vital importance at this time.

"Porcelain Jacket Crown Technic."

By A. L. Legro.....Detroit, Mich.

Syn.—Demonstrates a definite technic for making this most esthetic, as well as most valuable prosthetic restoration for the conservation of the dental pulp comparatively simple.

SECOND SESSION.

Prosthodontia.

"Selection of Artificial Teeth for Prosthetic Restorations."

By P. C. Lowery.....Detroit, Mich.

Syn.—Clearly demonstrates one of the most important phases of dentistry which a large majority of dentists do not seem to appreciate as much as they should. The doctor shows that it is much simpler to harmonize tooth and face form than it is to adapt the face of your patients to your ideal tooth form.

"Correction of Malocclusion in Artificial Dentures."

By M. M. House.....Indianapolis, Ind.

Syn.—Demonstrates with precision

the highest type of efficiency in artificial dentures.

Crown and Bridge Technic.

"The Gold Shoulder Crown Technic."
By Wm. H. Elliott.....Detroit, Mich.
Syn.—This technic of the most widely used restoration in dentistry is definite, accurate, and simple.

"Attachments for Vital Teeth in Fixed Bridge-work."
By Forrest H. Orton....St. Paul, Minn.
(Dr. Orton's reputation as a technician and teacher of teachable technic is so great that no dentist can afford to miss an opportunity to hear him lecture.)

"Mandibular Movements and the Forms of Artificial Bicuspids and Molars Necessitated Thereby."
By Prof. Alfred Gysi.....
.....Zurich, Switzerland.

"Mandibular Control."
By J. Leon Williams, New York City.

PROGRAM OF THE SECTION ON ORAL SURGERY, EXODONTIA AND ANESTHESIA.

New Orleans, La., October 20-24, 1919.

Officers.

Arthur E. Smith.....Chairman
210 South Lincoln St., Chicago, Ill.
Chalmers J. Lyons.....Vice-Chairman
Ann Arbor, Mich.
John W. Seybold.....Denver, Colo.
304 Mack Bldg.

FIRST SESSION.

Symposium: "Apicoectomy."

"Its Indications and Contraindications and Root-Canal Technic."
(Illustrated with stereopticon slides.)
By Thomas B. Hartzell.....
.....Minneapolis, Minn.

"Surgical Technic of Apicoectomy."
(Illustrated with stereopticon slides.)
By Chalmers J. Lyons.....
.....Ann Arbor, Mich.
Discussed by
Thomas P. Hinman.....Atlanta, Ga.
William L. Shearer.....Omaha, Nebr.
Carl D. Lucas.....Indianapolis, Ind.
Clarence J. Grieves....Baltimore, Md.
H. A. Maves.....Minneapolis, Minn.

"Nitrous Oxid-Oxygen Anesthesia in Oral Surgery and Dentistry."
By J. A. Heidbrink.....
.....Minneapolis, Minn.
Discussed by
Wm. H. Deford.....Des Moines, Iowa.
John W. Seybold.....Denver, Colo.
Boyd S. Gardner.....Rochester, Minn.

"Tic doloureaux—Etiology—Diagnosis—Treatment—Palliative—Blocking and Surgical."
By Rudolph Matas (M. D.).....
.....New Orleans, La.
Discussed by
Herbert A. Potts.....Chicago, Ill.

SECOND SESSION.

"Impacted Lower Third Molar."
(Illustrated.)
By George B. Winter....St. Louis, Mo.
Discussed by
J. P. Henahan.....Cleveland, O.
Harry W. Allen.....Kansas City, Mo.
O. T. Dean.....Seattle, Wash.
Roy S. Hopkinson....Milwaukee, Wis.

Symposium: "Block Anesthesia."

"Preparation of Solution."
By E. A. Litchfield....Humboldt, Nebr.

"Pharmacology of Various Local Anesthetics."
By Samuel L. Silverman.....
.....Atlanta, Ga.

"Indications and Contraindications."
By Fred F. Molt.....Chicago, Ill.

"Technic of Blocking."
(Most Important Injections.)
By .....

"Suggestive Therapy and Treatment of Abnormal Conditions During and Following Injections."
By P. G. Puterbaugh.....Chicago, Ill.

"Diseases of the Antrum."
(Illustrated with stereopticon slides.)
By Charles H. Oakman, Detroit, Mich.
Discussed by
R. Boyd Bogle.....Nashville, Tenn.
Truman W. Brophy.....Chicago, Ill.